SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

DOCTORATES CONFERRED BY AMERICAN UNIVERSITIES.

WE publish for the seventh year statistics in regard to the doctorates conferred by our universities. The degree of doctor of philosophy or of science was received by 281 candidates from 24 institutions. In addition to the 34 universities and colleges from which returns have been received, there may be a few cases in which the degree has been conferred legitimately by smaller institutions, but they are certainly very few. As a matter of fact, four fifths of all the degrees are conferred by seven universities. There have not during the past seven years, and probably never previously, been so many degrees conferred as in the present year. The numbers for the seven years are 234, 222, 239, 253, 216, 266 and 281. The figures fluctuate from year to year, but indicate an increase in seven years of about twenty per cent. This seems to be disappointingly small. In an article by Dr. Tombo, recently (July 15) printed in this journal, it is stated that the number of graduate students has more than doubled in the past five years, and in an article by Dr. Mayer, also printed here (July 8), it is said that the number of graduate students increased two and a half times from 1890 to 1902. It is not clear why the number who receive the advanced degree should not increase as rapidly as the number of graduate students. This is not due to a raising of the standards, as these have remained about stationary; nor is it due to lack of encouragement on the part of the universities, as fellowships and other in-

ducements are freely offered. Dr. Tombo states that Columbia has almost 700 resident candidates for the higher degrees, yet it conferred only 29 doctorates at the recent commencement. A large number of masters' degrees was conferred, but the men receiving this degree stop short of research.

TABLE I.

DOCTORATES CONFERRED.

	1898	1899	1900	1901	1902	1903	1904	Total
Yale	34	30	26	39	29	36	39	233
Chicago	36	24	37	36	27	32	36	228
Harvard	26	24	36	29	31	28	46	220
Johns Hopkins	33	38	33	30	17	23	31	205
Columbia	22	33	21	25	32	39	29	201
Pennsylvania	24	20	15	25	14	29	18	145
Cornell	19	7	19	21	23	20	13	122
Clark	12	5	9	7	1	4	10	48
Michigan	7	4	5	3	10	10	8	47
New York	5	9	7	6	4	4	9	44
Wisconsin	5	7	5	5	6	2	10	40
Virginia	0	2	2	8	6	3	1	22
Columbia	1	0	5	3	2	4	3	18
Minnesota	1	2	3	2	3	3	3	17
Brown	1	3	3	2	2	5	0	16
Bryn Mawr	3	3	1	2	2	0	5	16
California	1	3	2	2	1	3	3	15
Princeton	0	3	3	3	1	1	2	13
Boston	0	0	0	0	0	4	7	11
Stanford	2	0	2	2	2	1	1	10
Nebraska	2	1	1	1	0	0	2	7
Washington	0	2	0	1	0	1	1	5
Georgetown	0	0	0	0	0	3	1	4
Vanderbilt	0	0	3	1	0	0	0	4
Colorado	0	1	0	0	0	0	2	3
Kansas	0	1	0	0	0	2	0	3
Lafayette	0	0	0	0	0	3	0	3
North Carolina	0	0	0	0	2	1	0	3
Cincinnati	0	0	0	0	0	1	1	2
Iowa	0	0	0	0	0	2	0	2
Lehigh	0	0	0	0	0	2	0	2
Syracuse	0	1	0	0	1	0	0	2
Missouri	0	1	0	0	0	0	0	1
Tulane	0	0	1	0	0	0	0	1
	234	224	239	253	216	266	281	1713

The 1,713 men who have received the doctor's degree during the past seven years have not been selected by a severe process of elimination, but have in large measure been artificially encouraged. Probably not more than one in five of them will advance science or learning to a significant extent. Yet perhaps one half of all academic appointments are made from this small group. Science here suffers severely as compared with medicine or law, each of which professions receives some 5,000 recruits annually, allowing ample material for selection for the higher positions.

The first table gives details in regard to the universities which have conferred the degree during the past seven years. Harvard this year conferred 46 degrees, which is the largest number on the records. Yale, which like Harvard does not require the publication of the doctors' dissertations, still stands first in point of numbers, followed by Chicago, where the numbers are considerably augmented by degrees conferred on students of theology. A group of five universities conferred 181 out of 281 degrees. Wisconsin conferred 10 and Michigan 8 degrees; in view of the constant strengthening of the state universities and the large number of students from the central and western states who pursue graduate studies in the eastern institutions, we may expect a considerable increase in the number of degrees granted by the state universities. It is somewhat surprising that California and Stanford have together conferred the degree but twenty-five times in seven years.

TABLE II.

DOCTORATES CONFERRED IN THE SCIENCES.

	1898	1899	1900	1901	1902	1903	1904	Total
Chemistry	27	32	26	28	26	33	33	205
Physics	11	7	15	23	12	14	17	99
Zoology	12	11	11	15	16	12	15	92
Psychology	18	15	9	13	8	16	10	89
Mathematics	11	13	11	18	8	7	13	81
Botany	11	11	12	8	11	9	17	79
Geology	6	5	5	10	6	10	7	49
Physiology	4	1	4	1	8	8	1	27
Astronomy	3	2	4	5	2	4	4	24
Education	0	5	8	2	1	2	0	18
Sociology	0	5	3	3	4	2	1	18
Paleontology	0	4	2	1	0	2	2	11
Bacteriology	0	1	1	1	1	3	3	10
Anthropology	2	0	2	1	0	1	2	8
Agriculture	0	0	0	0	2	2	2	6
Anatomy	0	0	0	1	0	4	0	5
Engineering	0	0	0	1	0	3	1	5
Mineralogy	0	2	0	0	1	1	0	4
Pathology	0	0	0	0	0	3	0	3
Meteorology	0	1	0	0	0	0	0	1
	105	115	113	131	106	136	128	834

The second table gives details in regard to the natural and exact sciences, in which

about one half of all the degrees are conferred. There is this year a falling-off in the relative number in the sciences, which is, however, not large enough to be significant. The larger institutions, in which half or more than half of the degrees were this year in the sciences, are Harvard, Johns Hopkins, Cornell, Pennsylvania, Clark and Michigan.

TABLE III.

DOCTORATES CONFERRED IN THE SCIENCES.

	1898	1899	1900	1901	1902	1903	1904	Total
Johns Hopkins	19	17	20	19	9	10	17	111
Chicago	12	13	19	16	15	21	14	110
Columbia	10	23	12	13	14	18	11	101
Harvard	11	7	15	15	14	15	23	100
Yale	11	15	10	18	10	13	15	92
Cornell	11	2	11	13	16	13	8	74
Pennsylvania	8	8	6	12	5	14	9	62
Clark	12	5	9	7	1	4	10	48
Michigan	0	3	1	0	5	4	6	19
Wisconsin	2	4	1	3	4	0	4	18
California	1	3	1	2	1	3	2	13
Columbian	1	0	3	1	1	4	1	11
Bryn Mawr	1	2	1	2	1	0	2	9
Virginia	0	2	0	4	1	2	0	9
Brown	1	0	0	1	2	4	0	8
Stanford	2	0	0	1	2	1	1	7
Nebraska	2	1	1	1	0	0	1	6
Princeton	0	3	1	0	0	1	1	6
Minnesota	0	1	1	0	2	1	0	5
Washington	0	2	0	1	0	1	1	5
New York	1	1	0	1	0	0	1	4
Kansas	0	1	0	0	0	2	0	3
North Carolina	0	0	0	0	2	1	0	3
Lehigh	0	0	0	0	0	2	0	1
Vanderbilt	0	0	1	1	0	0	0	1
Colorado	0	1	0	0	0	0	0	1
Georgetown	0	0	0	0	0	0	1	1
Iowa	0	0	0	0	0	1	0	2
Lafayette	0	0	0	0	0	1	0	1
Missouri	0	1	0	0	0	0	0	2
Syracuse	0	0	0	0	1	0	0	1
	105	115	113	131	106	136	128	834

The third table gives details in regard to the separate sciences. There was an unusually large number of degrees with botany as the major subject. Otherwise there is no notable change in the positions of the subjects. The subjects in which three or more degrees were conferred by a university were: *Chemistry*—Yale, Pennsylvania, Columbia, Harvard and Johns Hopkins; *Physics*—Chicago, Johns Hopkins and Clark; *Zoology*—Harvard, Chicago and Johns Hopkins; *Botany*—Harvard and Wisconsin; *Mathematics*—Yale; *Psychology*—Clark.

The names of those on whom the degree was conferred in the natural and exact sciences, with the subjects of their theses are as follows:

JOHNS HOPKINS UNIVERSITY.

James Barnes: I., 'On the Analysis of Bright Spectrum Lines'; II., 'On the Spectrum of Magnesium.'

Harry Preston Bassett: 'Determination of the Relative Velocities of the Ions of Silver Nitrate in Mixtures of the Alcohols and Water and on the Conductivity of Such Mixtures.'

Charles Edward Brooks: 'Orthic Curves; or Algebraic Curves which satisfy Laplace's Equation in Two Dimensions.'

Charles Geiger Carroll: 'A Study of the Conductivity of Certain Electrolytes in Water, Methyl and Ethyl Alcohols and Mixtures of these Solvents; the Relation between Conductivity and Viscosity.'

Walter Buckingham Carver: 'On the Cayley-Veronese Class of Configurations.'

Howard Waters Doughty: 'Phenylsulphone-orthocarbonic Acid and Related Compounds.'

Otto Charles Glaser: 'The Larva of *Fasciolaria tulipa* (var. *distans*).'

Elliot Snell Hall: I., 'A Study of Some New Semi-permeable Membranes'; II., 'Experiments on the Preparation of Porous Cups suitable for the Measurement of Osmotic Pressure.'

Henry Dickinson Hill: 'Measurement of Self-Inductance.'

Arthur Isaac Kendall: 'An Investigation of the Methods of Bacterial Technique, Preparation of Cultural Media, Cultural Characteristics and the Classification of Bacteria.'

Ernest Gale Martin: 'An Experimental Study of the Rhythmic Activity of Strips of Heart Muscle.'

John Joseph Rutledge: 'The Clinton Iron Ores of Stone Valley, Huntingdon County, Pennsylvania.'

Harry William Springsteen: 'The Magnetic Rotatory Dispersion of Sodium Vapor.'

Charles Kephart Swartz: 'The Columbus Formation of Central-Northern Ohio, including an Account of the Geology of the Eastern Part of Marblehead Peninsula.'

David Hilt Tennent: 'A Study of the Life-History of *Bucephalus haimeanus*, a Parasite of the Oyster.'

William Phillips Winter: 'An Investigation of Sodamide and of its Reaction-products with Phosphorus and with Phosphorous Pentachloride.'

Rheinart Parker Cowles: '*Phoronis Architecta:* Its Life-History, Anatomy and Breeding Habits.'

UNIVERSITY OF CHICAGO.

Thomas Eaton Doubt: 'The Effect of the Intensity upon the Velocity of Light.'

George Harrison Shull: 'A Second Contribution to the Establishment of Place-Constants for Aster Prenanthoides Muhl. at Clifton, Ohio.'

Elizabeth Kemper Adams: 'The Esthetic Experience: Its Meaning in a Functional Psychology.'

Jessie Blount Allen: 'The Psychology of the Guinea Pig.'

Raymond Foss Bacon: 'On Sodium Benzohydrol.'

William Henry Bussey: 'Generational Relations for the Abstract Group, simply Isomorphic with the Linear Fractional Group.'

William Harve Emmons: 'The Geology of Haystack Mountains, Montana.'

Fannie Cornelia Frisbie: 'The Effect of Pressure on Magnetic Induction.'

Thomas Carlyle Hebb: 'The Velocity of Sound.'

Arthur Constant Lunn: 'The Differential Equations of Dynamics.'

Charles Dwight Marsh: 'The Plankton of Lake Winnebago and Green Lake.'

John William Scott: 'Studies in the Experimental Embryology of some Marine Annelids.'

Laetitia Morris Snow: 'The Effect of External Agents on the Production of Root-hairs.'

Charles Zeleny: 'Studies in Regulation and Regeneration.'

COLUMBIA UNIVERSITY.

Hal Truman Beans: 'Maminobenzonitrile and Some of its Derivatives.'

Louis Israel Dublin: 'The History of the Germ Cells in *Pedicellina Americana*.'

Myron Samuel Falk: 'On the Elastic Properties of Cement Mixtures.'

Charles Savage Forbes: 'Geometry of Circles Orthogonal to a Given Sphere.'

William Flowers Hand: 'A Further Investigation of Syntheses of the Alkylketodihydroquinazolines.'

William Jones: 'Some Principles of Algonkin Word Formation.'

William Erskine Kellicott: 'The Development of the Vascular System of Ceratodus.'

Arthur Colon Neish: 'A New Separation of Thorium from Cerium, Lanthanum and Didynium by Means of Metanitro Benzoic Acid.'

Naomi Norsworthy: 'The Psychology of Mentally Deficient Children.'

Hervey Woodburn Shimer: 'The Upper Siluric and Lower Devonic Faunas of Trilobite Mountain, Orange Co., N. Y.'

William Cullen Uhlig: 'The Nitrogen Contents of Commercial Distilled Water.'

HARVARD UNIVERSITY.

Edwin Plimpton Adams: I., 'The Electromagnetic Effects of Moving Charged Spheres'; II., 'Water Radioactivity; III., 'The Induced Radioactivity Due to Radium.'

Glover Morrill Allen: 'The Heredity of Coat Color in Mice.'

Lewis Darwin Ames: 'An Arithmetic Treatment of Some Problems in Analysis Situs.'

James Carleton Bell: 'Reactions of the Crayfish to Sensory Stimuli.'

James Mackintosh Bell: 'Report on the Michipicoten Iron Range.'

Albert Francis Blakeslee: 'Sexual Reproduction in the Mucorineae.'

Foster Partridge Boswell: 'Visual Irradiation.'

Daniel Francis Calhane: I., 'The Action of Sodic Ethylate on Certain Dibromdinitrobenzols, with Some New Derivatives in this Class'; II., 'On the Manner of Oxidation to Quinones in the Case of Aromatic Diamines.'

Henry Avery Carlton: 'On Some Addition Compounds Derived from Certain Aromatic Compounds.'

Frederic Walton Carpenter: 'The Development of the Oculomotor Nerve, the Ciliary Ganglion, and the Abducent Nerve in the Chick.'

James Brown Dandeno: 'An Investigation of Some of the Effects of Water and of Certain Aqueous Solutions Applied to Foliage.'

Joseph Horace Faull: 'The Development of the Ascus and the Formation of the Spores in the Ascomycetes.'

John L. Hogg: 'Pressure Gauges for High Vacua.'

Arthur Becket Lamb: 'The Specific Heats of Aqueous Salt Solutions.'

Robert Greenleaf Leavitt: 'Trichomes of the Root in Vascular Cryptogams and Angiosperms.'

Philip Anderson Shaffer: 'An Investigation of Metabolism in the Insane, together with a Discussion of Analytical Technique in Metabolism Experiments.'

Grant Smith: 'On the Eyes of Certain Pulmonate Gastropods, with Special Reference to the Neurofibrillae in *Linax* Maximus.'

Philip Sidney Smith: 'The Copper Sulphide Deposits of Orange County, Vermont.'

Alfred Marston Tozzer: 'A Comparative Study of the Mayas and the Lacandones.'

David Hutton Webster: 'Primitive Social Control: A Study of Initiation Ceremonies and Secret Societies.'

Roger Clark Wells: 'The Atomic Weight of Sodium.'

James Jacob Wolfe: 'Cytological Studies on Nemalion.'

Henry Cook Boynton: 'An Investigation into the Relation between the Treatment, Structure and Properties of Steel.'

YALE UNIVERSITY.

Silas Palmer Beebe: 'The Effect of Alcohol and Alcoholic Fluids upon the Excretion of Uric Acid in Man.'

Howard Logan Bronson: 'On the Transverse Vibrations of Helical Springs.'

Robert William Curtis: 'The Action of the Halogen Acids upon Vanadic Acid.'

Edward Lewis Dodd: 'Multiple Sequences.'

Ralph Davis Gilbert: 'The Estimation of Vanadium.'

George Samuel Jamieson: 'Researches in Organic Chemistry.'

Oliver Clarence Lester: 'On the Oxygen Absorption Bands of the Solar Spectrum.'

Herbert Edwin Medway: 'The Use of a Rotating Cathode in the Electrolytic Determination of the Metals.'

Elbert William Rockwood: 'Studies in Nutrition.'

Burke Smith: 'On Surfaces which may be Deformed with Preservation of a Conjugate System of Curves.'

Clara Eliza Smith: 'Representation of an Arbitrary Function by Means of Bessel's Functions.'

Robert Eccles Swain: 'The Formation of Kynurenic Acid by the Animal Body.'

Mignon Talbot: 'Contributions to a Revision of the Helderbergian Fauna of New York.'

Andrew Lincoln Winton: 'Studies in Methods of Proximate Organic Analysis.'

George Albert Young: 'Geology and Petrology of Mount Yamaska, Province of Quebec.'

CORNELL UNIVERSITY.

Fred William Foxworthy: 'On the Histological Structure of the Wood of the North American Coniferæ.'

Oskar Augustus Johannsen: 'The Chironomidæ.'

Thomas Lyttleton Lyon: 'A Method for Improving the Quality of Wheat for Bread Making.'

Alexander Dyer MacGillivray: 'The Embryological Development of *Corydalis cornutus*.'

Arthur Renwick Middleton: 'The Determination of Acetylene.'

Clarence Lemuel Elisha Moore: 'On the Quadratic Spherical Complex.'

Walter Porter White: 'Spark Damping and Hertzian Waves of Small Damping.'

John Wesley Young: 'On the Group of Sign $(0, 3; 2, 4, \infty)$ and the Functions belonging to it.'

UNIVERSITY OF PENNSYLVANIA.

Donald Sinclair Ashbrook: 'Electrolytic Separations Possible with a Rotating Anode.'

Lloyd Balderston, Jr.: 'An Interference Method for the Determination of the Speed of Sound in Liquids.'

Howard Winter Brubaker: 'Derivatives of Complex Inorganic Acids.'

Roy Dykes Hall: 'Observations on the Metallic Acids.'

Leslie Howard Ingham: 'The Use of a Rotating Anode in the Electrolytic Estimation of Zinc and of Nitric Acid.'

John Franklin Meyer: 'The Thermo-Electromotive Force of Nickel Nitrate in Organic Solvents.'

Sarah Pleis Miller: 'Determination and Separations of Gold in the Electrolytic Way.'

Ralph Emerson Myers: 'Results Obtained in Electro-Chemical Analysis by the Use of a Mercury Cathode.'

Everett Franklin Phillips: 'The Structure and Development of the Compound Eye of the Honey Bee.'

CLARK UNIVERSITY.

Charles E. Browne: 'Psychology of the Simple Arithmetical Processes.'

W. Fowler Bucke: 'Examinations and Grading.'

Edward Conradi: 'The Psychology and Pathology of Speech Development in the Child.'

Josiah Moses: 'Religious Pathology.'

August W. Trettien: 'Psychology of the Language Interest of Children.'

Fred Mutchler: 'A Study of the Structure and Biology of the Yeast Plant, *S. cerevisiae*.'

Jesse Nevin Gates: 'Cubic and Quartic Surfaces in 4-fold Space.'

Arthur L. Clark: 'Surface Tension at the Boundary Between a Liquid and the Vapor of another Liquid in the Neighborhood of the Critical Point.'

Joseph George Coffin: 'The Calculation and Construction of a Fundamental Standard of Self-induction.'

John Charles Hubbard: 'On the Conditions of Sparking at the Break of an Inductive Circuit.'

UNIVERSITY OF MICHIGAN.

Alphonso Morton Clover: 'A Study of the Peroxides of Organic Acids and the Hydrolysis of Organic Acid Peroxides and Peracids.'

Lewis Ralph Jones: 'The Cytolytic Enzyme produced by Bacillus Carotovorus and Certain Other Soft-rot Bacteria.'

Ward J. MacNeal: 'The Pathology of Experimental Nagana.'

Harriet Williams Bigelow: 'Determination of the Declinations of Certain North Polar Stars with the Meridian Circle.'

Edgar Nelson Transeau: 'The Bog Vegetation of the Huron River Valley.'

Frederick Amos Baldwin: 'On the Life History of Trypanosoma Lewisi and Trypanosoma Brucei.'

UNIVERSITY OF WISCONSIN.

Charles Elmer Allen: 'Nuclear and Cell Division in the Pollen Mother Cells of *Lilium canadense*.'

Rollin Henry Denniston: 'The Structure of Starch Grain.'

Susie Percival Nicholas: 'The Nature and Origin of the Binucleate Cells in Some *Basidiomycetes*.'

Fritz Wilhelm Woll: 'On the Relation of Food to the Production of Milk and Butter Fat by Dairy Cows.'

BRYN MAWR COLLEGE.

Virginia Ragsdale: 'On the Arrangement of the Real Branches of Plane Algebraic Curves.'

Marie Reimer: 'The Addition Reactions of Sulphinic Acid.'

UNIVERSITY OF CALIFORNIA.

William John Sharwood: 'A Study of the Double Cyanides of Zinc with Potassium and with Sodium.'

William John Sinclair: I., 'The Exploration of the Potter Creek Cave'; II., 'New Mammalia from the Quaternary Caves of California.'

COLUMBIAN UNIVERSITY.

Frank Van Vleck: 'Improvements in Ship Construction.'

LELAND STANFORD JUNIOR UNIVERSITY.

William Albert Manning: 'Studies on the Class of Primitive Substitution Groups.'

UNIVERSITY OF NEBRASKA.

Mrs. Edith Schwartz Clements: 'The Relation of Physical Factors to Leaf Structure.'

PRINCETON UNIVERSITY.

John Merrill Poor: 'Orbit of Comet 1900 II.'

WASHINGTON UNIVERSITY.

Samuel Monds Coulter: 'An Ecological Comparison of Some Typical Swamp Areas.'

NEW YORK UNIVERSITY.

Frederick G. Reynolds: 'The Viscosity Coefficient of Air and the Effect of the Roentgen Ray Thereon.'

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*SOME ASPECTS OF MEDICAL EDUCATION.**

THIS association has been, should be, and we trust will be the storm center of legislation for reform in medical education. Since the memorable editorials of Wood in the old *Philadelphia Times,* and the masterly papers and addresses of Pepper and the practical action of the University of Pennsylvania there has been virile progress. In most respects it seems definitely settled as to the course of education a candidate for the degree of medicine should take. Questions of pedagogy are still debatable, but we take it that that student who wishes the quickest returns, the most lasting remuneration, perennial stimulation of the intellect and continuous enjoyment in the pursuit of his labors, should take a college education of three or four years, a four years' course in medicine and, if possible, a hospital interneship.

Reference need only be made to the reports to this association, to the famous report of the majority committee of the Association of American Medical Colleges, to the numbers of the *Journal of the American Medical Association,* comprehensively devoted to education, and to many recent admirable addresses in support of the statements.

There is talk about maximum and minimum requirements, about laboratory and hospital courses, the merits of didactic

* Concluding part of president's address at the fifty-fifth annual session of the American Medical Association.

and clinical teaching—a mass of material brought forth from the viewpoint of the educator, or looking to the welfare of the medical profession. We do not minimize the value of such lines of discussion. It has brought us to the position we have attained. But what of the medical student? Should we not look at education from his point of view? Is he quite able to decide whether he should take up the profession of medicine? We hold that a great duty is due the aspirant for medical honors from teacher and practitioner. It is a kindness due him to point out the best methods of securing such education as will yield him results commensurate with the time and expense required. It would be a greater kindness to be enabled to show him that by reason of intellectual temperament or of physical or moral qualities he is not likely to reap the rewards he is anticipating.

The large majority of medical students do not have a good reason for studying medicine. They are ignorant of the mental and physical demands made on them. They are attracted by an uncertain glamor and a specious glory, and heedlessly they go in. The failure of a large percentage of graduates in medicine to acquire more than a bare existence, and too often not even that, proves that they were not educated properly, not fitted temperamentally nor physically, to pursue its duties. Should they not have opportunity for learning of the responsibilities and difficulties, rather than to have the brighter phases glorified? Would it not be well to have in our college curriculum a course of lectures for the student who contemplates entering a profession, pointing out the rocks and shoals in his prospective career? An eminent practitioner, not connected with medical schools, would light up and darken the pathway in due proportions. Then, too, should not, as in the army and navy, some physical tests be required? The trophy is to the robust, and sad will be the career of the man who is physically handicapped.

If there were any doubt about the value of a college degree to a man entering the medical profession it could be set at naught since the report of the Mosely Education Commission. Quotations like the following, while not pertaining to medicine alone, the result of extensive inquiry and mature deliberation, supported by the statistics they give, uphold the contention of a large employer, that 'for 99 per cent. of the non-university men, it is hopeless to expect to get to the top.' One opinion they express is that "there is still room for the boy of marked ability 'to come through,' but that his difficulties are greatly increasing, and that, useful as he is, his usefulness would have been greatly enhanced had he had the benefit of a college training." Still another commissioner reports that while only '1 per cent. of the entire population of America has received a higher education in her colleges and universities, this 1 per cent. holds more than 40 per cent. of all positions of confidence, of trust and of profit.' It is well known that the 'geist' of the individual brings success, for which they say "it is recognized that the educated man takes in a wide horizon and puts more 'soul' into his work."

The essential of success in any department is diagnosis, which requires powers of intellectual penetration and discrimination. President Thwing has again forcefully urged that 'reasoning of the mathematics—and mathematics is only reasoning—tends to promote *clearness* and *accuracy in perception, inevitableness in inference,* a sense of logical *orderliness.* The study of the languages represents the element of *interpretation.* The study of history means the interpretation of life.' Are these not the main studies of a college education? While they may promote scholarship, they surely cultivate thought. It

need scarcely be pointed out to this audience that to be a thinker is the salvation of the physician.

To the plea that the acquirement of a college degree takes up too much time and requires too much money, the material answer can be given from other sources to the effect that 'the men whom you are surprised to find holding such important positions in factories, though not much over thirty years, are the very men who did not leave the technical college till they were twenty-three or twenty-four; the graduate may have been twenty-five before he donned a jumper, but in five years he learned more with the college training he had as a foundation than the regular journeyman of fifteen years of actual work in the shop.' The experience of teachers who have watched the alumni agrees in that the college graduates get quick returns and soon acquire a position of independence.

The poor boy, therefore, need not be deterred, for if he has the spirit and energy to work his way through four years, two years or three years more will be but very little in the final summing up. If the student only knew that the purchase of the best education, whether reckoned in time or money, was the most economical investment, in that as to the former, a thorough education at first is time-saving in later years, and as to the latter, the money outlay is returned more quickly, in more immediate work and larger pay.

There should be one educational requirement—the equivalent of that for which a first-class college degree stands, whether received at a high school or university.

After entering the medical school with, it is presumed, the proper educational attainments, his career the first year should be closely watched. That school has too many students if it does not have enough instructors in the first year to be able to judge with a reasonable degree of accuracy of the character and moral stability of the men. This is not to be taken in a prudish sense or with too critical a scrutiny of habits which are the overflow of the animal spirits or the expiring exuberance of the boy approaching manhood. This can be said, that a student who does not play fair in his exercises, who cheats in one demonstration or evades another, who does not show manliness, frankness and truthfulness in his first-year duties, will not be a good diagnostician. He will cheat himself; he will cheat his patient. The teachers of the first year, or at least the second, should know this and block the student there and then. It would be a kindness. Let us then agitate whether we should not have a certificate of manliness, a certificate of health as well as a certificate of mental proficiency, before we admit students to our medical schools or permit them to go beyond the first year. Let us not be decoys, alluring them on to later destruction, but rather be guardians, wrapping the strong arm of experience about them to lead them to the fitting pathway.

Having permitted the student to pass further in his pursuits, we still owe him much. We must see to it that such course is given him the first two years of his student career that he will acquire such fondness for the science of medicine, such reverence for the exploration of its truths, that until his dying day devotion to it will be his stimulus and solace. As a corollary, we must insist that medical schools secure the best men in the market for these places and pay them salaries commensurate with their ability—good living salaries.

It is in the first and second years of his career that the foundations are laid whereby the student becomes the medical thinker. To quote again: "The power of thinking should not be of a base and barren character. The thinking should represent and be concerned with a fine and rich content of

knowledge. It should have the exactness of intellectual discrimination; it should have the fullness of noble scholarship; it should embody a culture which is at once emotional and esthetic and ethical, as well as intellectual.''

That a desire to relieve suffering, to extend sympathy, to save life, is the impulse of the physician, we all admit, but where is the man among us who will not also admit that a scientific habit more quickly brings it about and more surely sustains and fortifies the humane instinct through the trials and tribulations of exacting practise? That prosecution of professional duties soon becomes commercial that does not have for its basis a true spirit of scientific inquiry. How miserable must that life be which conducts an exacting, drudging, daily routine with only material reward in view. Few are the practitioners who have this sordid view; we can be as sure medicine would soon be forsaken if this viewpoint alone were considered. Hence in the laboratory of the first two years must be aroused and fostered the stimulus for life-work.

The final years should be clinical years, and the last should be in a hospital. The medical school that allows its students to think such opportunity is not due them is most unfair to them. As our schools are now constituted, most of them can not give such requirements. The students should know, however, such requirement is necessary. What has been said regarding the preliminary college education applies equally forcefully to the hospital training. He is thrice armed who enters the arena thus equipped. Medical schools that can not give such education are cruelly unkind and unjust to the students by having them think it is not essential. Medical colleges that pass off a hospital training for one that is not truly such fake their students. The student who pays well for his training has the right to demand such as to fit him for immediate action.

It is not the fault of the medical school alone that he can not get it. The public that cries out when there is mistake in diagnosis, fault in treatment, and that shakes its head at the deficient education of our students, must share the blame with the medical school. The public admits that its individual members may at any moment almost be at the mercy of a half-educated physician. It is not necessary to recount, for it is well known, how on land or sea, by day or night, some event may arise in an individual life, the care of which may mean life or death. Even with this knowledge they withhold means to relieve themselves. They admit the necessity of a hospital training. But they, and particularly the public in control of hospitals not used for teaching, say each medical college should have its teaching hospital. They do not appreciate that to give an education which involves a hospital course would require an expenditure of $500 a year for four years by each student. It has been estimated that the cost of maintaining a plant and paying salaries sufficiently large to accommodate 600 students would require the above outlay by each student. Unfortunately, it is impossible to expect students to pay such figures, as it would render entrance into the profession almost prohibitive. It is manifestly impossible, as medical schools are constituted now, to educate all the students of the land properly. Hospital training can not be given except by a few favored institutions, because the doors of hospitals are closed either by the governing body of the hospital or by the teachers in the medical schools.

We believe, personally, if a decree should be issued that no medical school, including its hospital, should exist except on the fees derived from students, but little hardship would follow. The lessened supply of stu-

dents would increase the demands on the practitioner, so that larger returns would follow. The poor student would sacrifice and strive to get a degree, knowing then he had a good asset. A diminution in number and an increase in quality is demanded alike by the public and the profession. Such diminution in number would mean that the student would get back his investment quicker and in larger amount than at present, hence good men would be attracted. If we could abolish sentiment for sense and educate accordingly, there might be betterment all around. As it is now, medical students receive part of their education through the bounty of the state or the charity of the public, as such education can only be given in endowed institutions. The public is taxed so that the prospective physician can make a living. Is it right that it should be? Perhaps a mechanic should demand such right to make his son a good workman. We must all admit it is the duty of the state to educate the youth, so that good citizenship is maintained; we can question whether the state should educate the members to obtain a livelihood.

With the same indifference that the public views an epidemic's march they allow hospitals that are engaged in teaching to suffer for the want of funds. Moreover, they close their doors to the advent of teaching in the hospitals under their control. We must admit those who do not appreciate the true function of a hospital have some ground for their contention. Ruled by sentiment chiefly, unfortunately an impracticable master, they sympathize with the patient who still harbors the belief of old that the medical student is one of a class that prowl about not unlike harpies. The public does not realize the difference in the student of to-day and the student of tradition. We can not hold to account the governing body of the hospital who has the point of view that it is harmful to a sick person to have them under the surveillance of an alleged student rabble. We must admit some patients become alarmed, particularly in institutions where they know they will have the sympathy of the governing body. An analysis of motive will show that the usual patient who will not allow a judicious amount of clinical demonstration when the sense of delicacy is not offended, is truly selfish, in that there is prevented that increase of knowledge and development of skill whereby suffering of others may be alleviated. A little encouragement from the officials would allay alarm on the part of the patient. The desire to help others is infectious, and when one yields in a ward, others vie in the work.

The truth of the matter is that in hospitals in which teaching is carried on, rarely, if ever, do the patients complain. Indeed, it is the experience of those teaching institutions that judiciously conducted instruction is appreciated by the patient. In one hospital we might name most of the inmates are pay patients, giving $7 a week willingly, because they know they are buying the services of the best practitioners in the land—the teachers of medicine—which service they could not get at tenfold the figure. The fact that teaching hospitals are overcrowded, not by the poor alone, but by people independent of charity, shows that clinical instruction is not a bugbear. If the governing boards would know that while a few patients might be alarmed, on the whole most of them would be gratified by the attention paid them, and their sense of rectitude and manliness appealed to by the satisfaction that they are doing some good in enlightening students, so that others could be relieved; that their administration would be stimulated to do work beyond criticism; that the nurses would be aroused to better activity while under the observation of those not connected with the hospital; that the internes would do their

very best to have most complete studies of the case, and finally, that the chief in attendance, compelled to do his best at the risk of his reputation, they would gladly open their doors, even at the discomfort of the few, but to the advantage of the many. In short, the hospital should have teaching not to oblige the medical school, but for its own survival and regeneration. The benefits the student derives by the object lesson of an orderly hospital can not be estimated. Will not every member of a hospital board admit that his own character, his own sympathies, have been benefited by his connection with the hospital, even though, perhaps, he has not the advantage of an impressionable age? Can he not see, therefore, how the youthful student can be influenced in thought and character and feeling? He can not lightly toss aside this responsibility, nor even hide it by putting the onus of medical education on the teaching hospital. Every dollar endowing a non-teaching hospital robs the teaching hospital which is engaged in this larger duty.

It is true a class who are compelled to have hospital attention may not sympathize with this feeling. How can we obtain the confidence of this class? Let us organize such association of prominent people in our teaching centers who will agree to have any operation, any feature of disease witnessed by medical students, at the judgment of their attending physician. It would be well if the individuals of such an organization would agree, first, to undergo hospital treatment; second, to be the object of observation by students; third, to have an autopsy performed in case of untimely end. Such association would rob hospitals of their terror and teaching of its dread. No one can deny that on the whole the public would be benefited from whatsoever point of view we look at it. Indeed, the public ought to learn that disease is an enemy to themselves and their country. Just as we make sacrifices in time of national warfare, so we should be willing to make sacrifices in the daily battle for life. Just as aristocrat and plebeian, landlord and tenant, fight side by side in the former, so they should array in solid phalanx in the latter.

But there are hospitals willing to admit students, and yet the privilege is not availed of. This arises because the teaching force of the medical college is not willing to sink its personality and allow the student to go wheresoever he will for his instruction. Courage and some sacrifice is required perhaps. But, when one thinks of the mighty opportunity and the frightful waste, it is saddening. Every hospital should be a school. The fourth year should be so arranged that the student could avail himself of the advantages of hospitals in the immediate vicinity. Let each teaching body have the student understand what he must see and do, and trust you the true student will see it at the best place and with the best men. He must be accountable, of course, with a rigidity that means the exact acquirement of knowledge. To this end the first two years could be well spent in the properly equipped laboratory university, whether in town or country, the third in the authorized hospital of the school, the fourth in extramural hospital work.

Is it not anomalous that the hospital boards give to the nurses who are to act as aids to the physician the highest opportunities, and yet deny it to those who are to give orders to the nurses? This, of course, arises because training schools are the product of modern thought and have not been trammeled by tradition.

But all this talk of the primary education avails but little if we do not see to it ourselves that education is continuous; that from the day of our graduation, forwards, we do naught but toil, toil, toil. It should go without saying, as a mere business proposition, that unless we unceasingly

labor but little of the fruits do we pluck. It is demonstrated in a practical manner, for when we look about us and find the methods of those of our brethren whose labors are not in vain each one bears the scent of midnight oil.

The development of post-graduate schools, the growth of libraries, the groans of the printing press, the enthusiasm of medical societies, all testify to the spirit of persistent self-education that is abroad. It is not for me to urge further the importance of each of us taking from time to time months for study and reflection. Every active doctor should have his sabbatical year. We dare say, extended observations would uphold that in income a gain is one hundredfold for each dollar invested in educational outings, and for every hour thus employed, ten is added to life. To finance a medical man from first to last successfully, we dare say spend all net earnings of the first five years on self-education; 25 per cent. of each five years for further education; after ten years, 10 per cent. of the annual net earnings for an assistant, continuing the 25 per cent. investment each five years. Health, happiness, increased usefulness to the community —a success which never comes from eccentricity, equal to doubling capital every ten years, would follow. To this must be added the great mental satisfaction of a more clairvoyant vision in the prosecution of his daily duties, the inspiration that comes from the doing of things, the stimulation that arises from the solving of problems.

In the course of our work it is necessary for us to halt from time to time and review. Few of us are they who will not find as our days grow fuller an unconscious tendency to slight our work, to become slipshod, to hurry over matters. It is partly an evidence of overwork. The post-graduate school is the salvation. No obstacle can withstand the continuity of drill, which the earnest of us keep in action. If, to continue the imposition, asked what element of character is perhaps lacking to the greatest detriment to the profession and public, we possibly, one and all, would say courage. This is seen in the hesitancy which members of the profession show in giving an opinion, in advising an operation and in asking for an autopsy. How much confidence is destroyed by the want of free, frank avowal of the physician that he does not know on the one hand, or of clear, precise statement of his judgment concerning a case on the other! The greatest success in life is confidence. How many lives are lost by the worker in internal medicine not advising early and unequivocally an operation for fear he might be wrong in his diagnosis! And how many more are lost because the surgeon lacks courage to do, either because he fears the patient may die and his record be marred, or because he may operate when it is not necessary! We must admit we have had some operations done when they were not required, but let it be said to the credit of modern surgery, we have never seen an operation of such character performed by the right man that did any harm to the patient. On the other hand, the resort to operative procedures early, and in cases that even yet are not considered of surgical relief, has saved lives and lessened suffering to a degree that far overbalances the now and then futile measure. It may be assumed, without contradiction, that every case of bad appendicitis that happens to get well without surgical relief has in its wake three to five that die for the want of an operation. In other words, the pernicious influence of a surgical case that recovers without operation is evident in creating the hope that other cases demanding operation might get well without it.

And the man who does not want an autopsy—not only the centers of courage need

stimulation, but too often the entire medical storehouse needs refitting. Something, best known to the physician himself, we trust, is lacking in the one who treats an obscure case for a day, six days, six weeks, and then does not want an autopsy. If true to himself, true to the demands of his profession, courage will not fail him. In our mental and physical round-up, we must see to it that courage is given a new backbone from time to time.

But, fellow members of the association, not alone as members of this organization may we indulge in self-congratulation, but as members of a profession whose limitation knows no bounds, we may join in felicitation. Neither language, nor creed, nor country fetters our profession's munificent sway. The thoughts of Ehrlich in Frankfurt, of our own Welch or Councilman, of Kitasato in Japan, are correlated. The knife of Mayo in America, of Robson in London, of Kocher in Berne contributes to the relief of suffering in far Cathay. The founts of Lister's genius and Pasteur's divine inspiration bring countless blessings to England, to India, to France and to Africa. What a stimulus it is to realize that, howsoever small the contribution of the humblest of us may be, its impulse will be felt in climes near and far and ages present and remote! What awe can not but overtake us when we consider each heart throb we study entwines us to Harvey of two centuries ago; with every percussion tone reverberates the sound of Laennec's voice of a century; with each vaccine inoculation, the simple observation and reasoning of Jenner to stimulate our question and deductions!

We rejoice together and cherish our history, by the warp and woof of which we are woven to the past. What heritage for us and our children! Dead must be the soul that wearies of communion with the spirits of the past; deep must be its slumber on which falls the thought of centuries; lethargic its activities that are aroused not by the deeds of heroic men! "Honor and fortune exist to him who always recognizes the neighborhood of the great, always feels himself in the presence of high causes." We worship together our science, devotion to which brings forth character, smothers egotism, levels pretension, drives out solitude, develops such loftiness of thought which can see that 'against all appearances the nature of things works for truth and right forever.' Of our art, let us see to it that when the final summons comes it can be said of us, "Greater love hath no man than this, that a man lay down his life for his friends."

JOHN H. MUSSER.

PHILADELPHIA, PA.

NATHAN SMITH DAVIS.

IT is the sad duty of this academy to chronicle the death of its oldest member, one of its founders, who during the more active years of his life was one of its ardent workers. Dr. Nathan Smith Davis left this life on June 16, 1904. In his last illness he fully realized the coming change, which he foretold beautifully in one short sentence, 'I am going home.'

Dr. Davis lived a long, active and useful life. He was a man of supreme earnestness and seriousness; of great force of mind and strength of character; of high ideals and simple tastes.

His intense and lifelong sustained motive—or inspiration—to accomplish thoroughly the many useful ends to which he devoted his wonderful activity, left scarcely time for recreation. It left no time or thought for indulgence. His life was too full of purpose to lend much of its strength to self-gratification, nor was there much temptation in his well-ordered course. His chief pleasure was the satisfaction of useful accomplishment, and he found his

recreation in diversity of employment. Rarely, very rarely, do we see such subjugation of the material man to the higher attributes of his being. He led an ideal, normal life on a high moral and mental plane; as he ignored the pleasures of the flesh, so he was also superior to its discomforts, and endured its sufferings with fortitude through many years.

His lithe and vigorous body was the ready servant of his wonderfully well-coordinated mind and imperious will, and this with him meant much, for the demands he made upon his physical endurance were excessive.

His comprehensive and prophetic mental vision foresaw the needs of his profession, and of his community, and was a guide to his remarkable executive faculty. His qualities all combined to make him a pioneer among thinkers, and a general among organizers. It was through his semi-public deeds that he was most widely known—his great powers of mind found here their broadest opportunities, and it is through them that his memory will longest survive. The impress of his individuality was marked wherever his energy found outlet, and his rank was always among the leaders. But his memory's richest heritance is not bound with his triumphs; it lives in the homes of the thousands to whom he ministered in their sufferings, and who felt that in him they had a wise and loyal friend; and again, in the minds and hearts of his many students, whose ideals were shaped by his life and conduct. All who knew him best knew the spirit of kindness that ruled his heart. His private life was as unassuming as his public life was aggressive. Among his friends he was quiet, cordial, not very communicative, but spiced his conversation often with a tempered genial wit.

A brief review of his career will show the richness of his life. His primitive environment in youth and his limited opportunities in education throw his successes into strong relief, and accentuate the advantages to a man of an active, earnest mind, simple manners and upright ways.

He was born January 9, 1817, in Chenango County, N. Y., where his father had cleared ground for a farm. His first home was a log cabin, and his earliest realizations were the stern necessities in the struggle of subjugating the forest to man's needs.

His first sorrow was the loss of his mother when seven years of age.

From early youth his mind was bright, active and acquisitive. He attended the district school in winter months and at sixteen was given a year in the Cazanovia seminary. In 1834 he began the study of medicine under Dr. Daniel Clarke, of his native county. He shortly entered the College of Physicians and Surgeons of New York, and graduated January 31, 1837. In the meanwhile he had studied in the office of Dr. Thomas Jackson, of Binghamton. His graduating thesis was characteristic of him. Although still hardly more than a boy in years his selection of subject indicated breadth of understanding and his attitude towards existing opinion was bold and well taken. The subject was 'Animal Temperature,' and in it he took issue with the then existing authoritative view that the animal heat was developed within the lungs, and supported his arguments in refutation by recorded experiments.

In the following years he practised in Vienna, N. Y., and in Binghamton. In the latter town he married a daughter of the Hon. John Parker—the wife who survives him.

In these early years he found time, aside from his professional duties, to further prosecute his medical and surgical studies, and to broaden his field of knowledge in the allied sciences and economics. His mental activity soon gained him distinction. He wrote easily and freely, and several of his

medical articles won prizes. He was soon known throughout the state and became an active and prominent member of the state medical society.

In 1845 Dr. Davis was a prime mover and chairman of a committee to call a national convention of delegates from medical societies and medical schools of the different states to meet in New York. From this developed the American Medical Association, the National Medical Society of our country, in which he justly took great pride, and which in turn revered him as its founder and chief organizer and most hearty supporter.

Through his early work in this broad organization he became yet more widely known.

In 1847 he engaged in practice in New York city and, in his medical alma mater, began his long career as a teacher. Two years later he accepted the chair of physiology and general pathology in Rush Medical College of Chicago. In 1859 the medical department of Lind University—later the Chicago Medical College, and at present the medical department of Northwestern University—was organized with the express object of establishing a *graded course of medical instruction.* At that time no medical college in the country had a graded curriculum and the enterprise in hand was epoch-making. Dr. Davis was invited to take the chair corresponding to the one he held at Rush, which, after endeavoring in vain to persuade his colleagues to commit themselves to the graded system, he accepted, and took his seat in the faculty of the new college, where he remained until the time of his death. During many years he was the chief of the medical department and the dean of the faculty. During the last years of his life he retired from active service, but retained his connection with the school as emeritus dean and professor of the principles and practice of medicine and clinical medicine.

In supporting this new departure in medical teaching he followed his preconceived ideas. As early as 1843 he had earnestly advocated higher standards of professional qualifications for the practice of medicine in an address before the New York State Medical Society, and this opportunity to put his convictions into practice was eagerly seized, and the steady upbuilding of the new school was a vital part of his life work and that of his colleagues.

Dr. Davis's interests and activities were by no means confined to the field of medicine. He was one of the initiative factors of the Chicago Academy of Sciences, of the Chicago Historical Society, of the Illinois State Microscopical Society, of Northwestern University, and of the Union College of Law, of which faculty he was a member, filling the chair of medical jurisprudence. He was also one of the founders of the Illinois State Medical Society.

During all his life he was a warm friend and a strong supporter of the cause of temperance, and one of the founders of the Washington Home.

In addition to his many duties he was a prolific writer and contributed much with his pen to guide professional thought and mold public opinion. He was for many years editor of the *Northwestern Medical Journal.* He afterwards edited the *Journal of the American Medical Association* from 1883 to 1889, a task arduous in itself, but for which he found time amid the many other calls upon his strength and energies.

In 1887 he took an active part in preparing for the International Medical Congress to be held in Washington, D. C., and was at first secretary general and later president of the executive committee.

None except those with him at that time can realize the enormous amount of work entailed upon him by the many simultaneous duties in his various capacities of medi-

cal practitioner, medical teacher, editor of the *Journal of the American Medical Association* and secretary general of the executive committee of the International Medical Congress. During this severe strain he was stricken with complete right-sided paralysis, from which he fortunately soon recovered, but which left him with a slight weakness of the affected side. This illness, although so serious, was for him only an incident. With his returning strength he again took up his burdens and worked on with energy, patience and success. In this he exemplified his dominating characteristics. Whatever he did was done with all his might, and here we have the secret of his life: it was his strength of character, his physical and mental efficiency, his singleness of purpose, his transcendent altruism that made him a so potent factor in the development of so many of our useful institutions.

With the cessation of his works, and the extinction of the light of his life we have lost an active agent and an unwavering beacon in the upward trend to better things.

Frank S. Johnson.

SCIENTIFIC BOOKS.

Observations and Investigations made at the Blue Hill Meteorological Observatory, Massachusetts, U. S. A., in the Years 1901 and 1902, under the direction of A. Lawrence Rotch. Annals of the Astronomical Observatory of Harvard College, Vol. XLIII., Part III. 4to. 1903. Pp. 115–239. Pls. IV.

The Blue Hill volumes of the *Annals of the Harvard College Observatory* are always sure of a warm welcome at the hands of meteorologists, because of the importance and the high quality of the results which they contain. The present volume is no exception to this general rule. If there be any who do not know what meteorology owes to Mr. Rotch, such persons will find a simple statement of the reason for this great indebtedness in the following words, quoted from the introduction to the volume before us, which is signed by Mr. Rotch: 'All the expenses of the observatory continue to be paid by the undersigned, except the cost of publishing the investigations and observations.'

The introduction makes fitting mention of the death of Mr. A. E. Sweetland, the youngest member of the Blue Hill staff, whose name has already appeared in the columns of Science in connection with investigations carried on by him at the observatory. A fireproof addition to the observatory has been built, containing a library and a storage room for kites, and certain other much-needed additions to the older building have been made. It may be noted, in passing, that the total cost of these additions and alterations amounted to $7,000, and was paid by Mr. Rotch.

Besides maintaining the routine observations and automatic records at the summit and base stations, the chief investigation carried on at Blue Hill Observatory has been the exploration of the air by means of kites. The observations obtained by means of kites from August, 1894, to February, 1897, were published and discussed in Vol. XLII., Part I., Appendix B, of the *Annals of the Harvard College Observatory*. In the present volume the kite observations, together with the simultaneous ground observations, from March, 1897, to the close of the year 1902, are published in full (Appendix C, by H. H. Clayton), while the discussion of these observations, which is eagerly awaited, is reserved for a later volume. Since December, 1901, kite flights from Blue Hill have been made once a month, when possible, in cooperation with similar ascents of kites and balloons in Europe, carried out under the auspices of the International Committee for Scientific Aeronautics, of which committee Mr. Rotch is the American member. The results of the kite flights made from the deck of a steamer during a trip across the North Atlantic, reference to which has been made in these columns, are given in Table XIV. It will be remembered by readers of this journal that, as the result of his success in flying kites from the steamer on this trip, and previously from a tow-boat

in Massachusetts Bay, Mr. Rotch proposed an investigation by means of kites, flown from on board ship, of the meteorological conditions above the trades and the doldrums, a project which has received the approval of the International Aeronautical Congress, and of other scientific bodies.

The 'Effect of Meteorological Conditions upon Audibility' under various conditions at Blue Hill was observed during the year 1901, and the results are discussed by Mr. Rotch on pages 156–163. The source of sound was a steam whistle in the town of Hyde Park, the whistle being 4,400 meters northwest of and about 170 meters below the observatory. Investigations upon the electrification of, and upon the quantity of carbon dioxide contained in the air were conducted at the observatory by Mr. G. W. Pickard. Appendix D (pp. 215–239) is a discussion of 'Kites and Instruments Employed in the Exploration of the Air, at Blue Hill Observatory, 1897–1902,' by S. P. Fergusson, which will be found useful by any persons who are undertaking scientific kite construction. Of special interest are the sections which concern kite meteorographs, in devising and constructing which Mr. Fergusson has shown the greatest skill, ingenuity and patience.

Since Blue Hill Observatory first began its pioneer work in kite meteorology there has been a remarkably rapid development of similar work in Europe and elsewhere, but there is no reason to fear that the Blue Hill results will suffer in any way by comparison with those obtained abroad. R. DEC. W.

Vorlesungen ueber theoretische und physikalische Chemie, drittes Heft, Beziehungen zwischen Eigenschaften und Zusammensetzung. Second edition. By J. H. VAN'T HOFF. Braunschweig, Vieweg. 1903. 8vo. Pp. x + 155.

This is the third and concluding part of the second edition of Professor van't Hoff's 'Lectures.' Since the German, French and English versions of the first edition were noticed in SCIENCE, it is sufficient to say that in the present edition the subdivision and treatment of the subject are the same as in the first. There are a few verbal changes and some slight additions amounting to ten pages. The value of the book is immensely increased, however, by the fact that an index to the whole work has been furnished. The book is so familiar to chemists as a masterpiece of its kind that further commendation would be superfluous. ALEXANDER SMITH.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Comparative Neurology and Psychology for July contains in addition to editorial and review matter, a paper of 67 pages by Miss Jessie Allen, entitled, 'The Association Process of the Guinea Pig, A Study of the Psychical Development of an Animal with a Nervous System well Medullated at Birth.' This research forms an excellent control to the similar one recently published by Dr. J. B. Watson on the white rat, the nervous system of which is entirely non-medullated at birth. The rat comes to psychical maturity at about the twenty-third day; the guinea pig, on the other hand, reaches psychical maturity on the third day, but even in the adult lacks almost entirely that ingenuity which is so characteristic of the rat's method of overcoming obstacles in order to reach food. Histological examination of the developing guinea pig's brain reveals differences from the developing rat's brain which can be closely correlated with the differences in psychical development.

A QUARTERLY journal entitled 'Opthalmology' will begin publication on October 1, with Dr. H. D. Wurdeman as editor and publisher. The associate editors include Drs. Chas. H. May, New York City; Casey A. Wood, Chicago; Chas. A. Oliver, Philadelphia; Blencowe E. Fryer, Kansas City; Albert B. Hale, Chicago; Edmond E. Blaauw, Buffalo; Chas. Zimmermann, Milwaukee; Dr. Wm. Zentmayer, Philadelphia; J. Guttman, New York City; and Frank Allport, Chicago.

SOCIETIES AND ACADEMIES.

THE BIOLOGICAL SOCIETY OF ST. LOUIS.

IN an earlier number of this journal, August 14, 1903, there appeared a brief notice of the organization of the Biological Society of St. Louis. Since that time a more formal

organization has been effected, and since the society has constantly increased in strength and importance it seems desirable to give a brief account of the scientific programs of all the meetings which have been held up to the present time.

At the first meeting of the society, held at the rooms of Professor Greeley, March 3, 1903, Dr. A. W. Greeley reviewed and discussed the work of Calkins upon the life-cycle of *Paramœcium caudatum*. The program of the second meeting, March 24, at the home of Professor Coulter, consisted of a discussion by Dr. J. M. Prather, of Loeb's investigations on and theories concerning the prolongation of life in unfertilized eggs and a review by Mr. J. Arthur Harris of the essential features of the mutation theory as elaborated by Professor De Vries. At the third meeting, with the society as the guests of Dr. Budgett, April 28, Dr. Oscar Riddle discussed the papers of Dr. Eigenmann on the eyes of the blind vertebrates of North America. Dr. Riddle had assisted Dr. Eigenmann in much of this work and in more yet to be published, and consequently the general discussion of the broad outlines of the problems involved and their relation to the whole perplexing question of degeneration were of especial interest. At this meeting, Mr. W. L. Eikenberry discussed the literature of the synthesis of carbohydrates in chlorophyll-bearing plants in the light of recent work on 'extra-organic' photosynthesis —a paper calling forth considerable discussion, because of the fundamental importance of work on enzymes. On June 2, the society was the guest of Mr. Eikenberry. Mr. J. B. Lillard reviewed Dr. Lillie's work on the refusion of blastomeres and an electrical explanation of mitosis, and Professor S. M. Coulter reviewed the treatise of Livingston on the rôle of diffusion and osmotic pressure in plants. The society adjourned for the summer months.

On September 26, the society convened at the residence of Dr. Budgett. The host presented a review and discussion of the recent work of Hardy on the behavior of protoplasm and artificial colloidal solutions. October 28, the society was the guest of Drs. Eycleshymer, Potter, Wilson and Ransom. An extensive business session in which several important points in the policy of the society were discussed and fixed, was followed by the scientific papers of the evening. Mr. Perley Spaulding reviewed Ewart's work on protoplasmic streaming in plants, and Dr. Peter Potter discussed his own work toward the establishment of a norm-plate of the human body. By new methods of hardening, it is possible to retain the organs in the position occupied during life while serial sections are made, and from measurements and tracings made from these, norm-charts may be prepared which illustrate with a high degree of accuracy the relative positions of the various organs. Numerous charts to serve as data for the completed work were exhibited. December 2, the society held its session at the residence of Mr. Drayer. Among other business matters, the report of a committee on membership, recommending that election of new members, duly proposed and recommended by sponsors at a previous meeting, should be by unanimous ballot of members present, was accepted. The scientific program consisted of three original papers. Dr. E. C. Eycleshymer exhibited and discussed the more important features of the plates so far prepared toward the norm-plates of *Necturus* on which he is working for Kiefel's 'Normaltafeln zur Entwickelungsgeschichte der Wirbeltiere.' Dr. J. Arthur Harris presented preliminarily the results obtained from a study of apically dehiscent anthers. It seems that there is a relation not only between this mode of dehiscence and the form of the anther and other floral parts as well, but between these and the geographical distribution of the genera and species in which it occurs. Professor S. M. Coulter discussed the establishment of the new biological station in the Bermudas and gave the results of his ecological reconnoissance of the islands. All of these papers will appear later. January 6, 1904, the meeting was held at Hotel Granville. Dr. G. H. Holferty presented his paper on the development and phylogeny of the archegonium of *Mnium cuspidatum*, which has since been published in the *Botanical Gazette*. Dr. A. W. Greeley discussed his work on the structure of proto-

plasm, giving the results of a continuation of the experiments described in a preliminary contribution to an earlier number of SCIENCE. This paper and a biographical sketch of its author by Dr. Lyon has appeared in the *Biological Bulletin* since the death of Dr. Greeley. January 27 the society again met at Hotel Granville. Dr. R. J. Terry discussed the results of his researches on the skull of *Necturus*, soon to appear in one of the German anatomical journals. The officers for the year were elected as follows:

President.—Dr. B. M. Bolton.
Vice-President.—Mr. H. C. Drayer.
Secretary.—Dr. J. Arthur Harris.

On the evening of February 26, the society was the guest of Dr. Bolton. Dr. W J McGee, chief of the department of anthropology at the Louisiana Purchase Exposition, presented the scientific paper of the evening, having selected for his theme some phases of the adaptations of desert faunas and floras to their environment. He first compared certain old world deserts, with their very scant plant and animal life, with those of the new, where organisms show a high degree of systematic differentiation, and attributed this to the more rapid development of desert conditions in certain old world areas. There the changes were too rapid to permit the evolution of an adaptive habit and structure while in the American desert conditions have permitted the evolution of special forms well adapted to environment. He briefly described and traced the development of the clumps of vegetation so characteristic of the American deserts and discussed the interdependence, seeming almost a symbolic relationship, between the different plant and animal species of which they are composed. Some remarkable cases of symbiosis were described and special emphasis was laid upon the origin and development of symbiotic relationship under the excessively severe life conditions presented by a desert and some suggestions made upon the importance of these conditions in human civilization. March 30 the society was the guest of Dr. Terry. The report of a committee appointed to draw up resolutions concerning the death of Dr. Greeley was received. The scientific papers of the evening were three. Dr. C. Fish reported upon his investigations of the nature of an antitrypsin, produced by immunization with pancreatic extracts. He could demonstrate that this antiamboceptor is thermstabile (60° C.) and combines with the haplophorous group of the trypsin. As to the latter positive proof could be brought, that its active form is the combination of the pancreatic proenzym with enterokinase, thus confirming the views of Pawlow and others. The enterokinase forms the complement. Mr. G. E. McClure spoke on the symbiotic relation between ants and certain plants, giving a general view of the subject and exhibiting illustrative material. The significance of such data as that furnished in this field in the solution of the much-vexed question of the origin of adaptations was extensively discussed. Dr. B. M. Bolton spoke on his already published work on the effect of certain metals and metallic salts upon the growth of bacteria and exhibited a large series of very interesting preparations. At the meeting of the society, held in the Central High School, April 27, Mr. F. A. Lucas, of the United States National Museum, presented an illustrated paper on the whale, discussing morphological, biological and economic questions concerning the different species and whale fisheries. The final meeting of the spring was held at the Cherokee Garden, May 25. Mr. J. F. Abbott spoke of his work on the highly interesting *Cœloplana*. Extended collecting during the course of two summers at Misaki, Japan, resulted in the securing of some thirty or more of Kowalusky's *Cœloplana*. No embryological material was obtainable, but by good luck in fixing, the histological details have been worked out and the morphological position of the form pretty definitely established. *Cœloplana* is without doubt a ctenophor derived from the Cydippida, that has abandoned a pelagic life and taken up a littoral habit with a corresponding change in body form and consistency, loss of costæ, reduction of otolith and great extension of the gastric canal system. Most of the essential ctenophoral characters, such as the grasping

tentacles, the adhesive cells, epithelial gland cells, ciliated rosettes, etc., have been retained unchanged. The ciliated rosettes, for example, must be looked upon as vestigial structures, in a form with so little parenchyma and such an extensive gastric canal system as *Cœloplana* possesses. And all the details of structure indicate a highly specialized form rather than a primitive one. *Ctenoplana* would seem to represent a midway stage in which the costæ have been reduced, but not entirely lost. Such a loss of an organ through disuse indicates merely specialization and adaptation to littoral conditions rather than degeneration. Hence Willey's contention that *Ctenoplana* is not 'degenerate' is unnecessary, and his hypothesis that the form is a primitive one, untenable. Dr. J. Arthur Harris spoke of recent experimental work in floral ecology, discussing the relative importance of color and odor in the attraction of insects as shown in the work of Plateau, Andreae and others. Professor Abbott was elected to membership—the first person to be elected to membership in the society—after which the society adjourned until the September meeting.

J. Arthur Harris,
Secretary.

AMERICAN FISHERIES SOCIETY.

The thirty-third annual meeting of the American Fisheries Society was held at Atlantic City, New Jersey, July 26–28. Seventy members, representing 26 states, were in attendance. About 50 new active members were elected, and 6 foreigners were made honorary members. The officers for this meeting were:

President.—Frank N. Clark, Michigan.

Vice-President.—Tarleton H. Bean, New York.

Recording Secretary.—George F. Peabody, Wisconsin.

Corresponding Secretary.—W. de C. Ravenel, Washington, D. C.

Treasurer.—C. W. Willard, Rhode Island.

The sessions were devoted largely to the presentation and discussion of papers, which covered a wide range of subjects. Among the noteworthy papers were the following:

Dr. Tarleton H. Bean: 'The Fish and Game Department of the Universal Exposition at St. Louis.'

Mr. W. E. Meehan: 'A Year's Work of the Fisheries Interest in Pennsylvania.'

Dr. H. F. Moore: 'An Account of Progress in Sponge Culture.'

Mr. Charles G. Atkins: 'The Utilization of Neglected Fishes.'

Dr. F. M. Johnson: 'A Western Charr in an Eastern Home.'

Mr. S. G. Worth: 'The Cultivation of the Striped Bass.'

Mr. John W. Titcomb presented some 'Fishery Reminiscences of South America,' and Dr. H. M. Smith gave a lecture on 'Japan, the Paramount Fishery Nation,' illustrated with lantern slides.

One session was devoted to a very interesting symposium on the black basses and their cultivation; and the carp question incidentally came up on several occasions.

Mr. George F. Peabody paid a feeling tribute to the late Hon. E. E. Bryant, president of the Wisconsin Fish Commission, who died while on his way home from the last meeting of the society at Woods Hole.

Near the close of the session, U. S. Fish Commissioner Bowers was called for and made some felicitous remarks.

Mr. Henry T. Root, president of the Rhode Island Commission of Inland Fisheries, was elected president of the society for the next term, and White Sulphur Springs, West Virginia, was selected as the place of meeting in 1905.

The society has about 450 active members, most of whom are engaged in practical or administrative work in fish culture or fishery protection, but some are biologists whose work brings them into touch with the fishery interests, others are commercial fishermen, and a few are simply anglers.

DISCUSSION AND CORRESPONDENCE.

AREAS IN THE UNITED STATES SUITABLE FOR BEET CULTURE.

To the Editor of Science: In the second part of Professor Armstrong's article, which appeared in Science, August 5, 1904, I note the statement made by him in regard to the preparation of a map showing the probable areas in the United States suitable for beet culture. In this connection it is only just

that reference should be made to the fact that the first map of this character published in the United States was constructed by Dr. Wm. McMurtrie and published in a special report, No. 28, of the U. S. Dept. of Agriculture in 1880. In Dr. McMurtrie's map the area of successful beet culture was indicated by a region contiguous to a line showing a temperature of 70° Fahrenheit during June, July and August and rainfall above two inches for the same months.

The remarkable success which attended the growth of sugar beets in the semi-arid regions of California in the early '80's led me to discard the factor of rainfall and to construct a map based upon temperature conditions alone, during the growing season. Some of the very best areas in the United States, suitable for beet culture are in arid and semi-arid regions. The idea, however, of mapping the beet areas in this country should be credited to Dr. McMurtrie.

H. W. WILEY.

JORDAN ON FOSSIL LABROID AND CHÆTODONT FISHES.

IN a recent paper on Eocene fishes from Monte Bolca, the present writer followed Dr. D. S. Jordan in his excellent 'Review of Labroid Fishes' (*Rept. U. S. Fish Comm.* for 1887 (1891), pp. 559–699) in uniting Cuvier's genus *Crenilabrus* with the earlier described *Symphodus* of Rafinesque. He also adopted the views of Agassiz and most recent authors in referring *Pygæus* to the Chætodonts. Since this paper was published,* the writer has received from President Jordan some valuable notes on the relations of the Eocene forms to existing genera, and as these are of extreme interest to students of both fossil and modern faunæ, advantage is here taken of his permission to make them available for others.

The following extracts may be considered as the most recent and authoritative opinion that has been pronounced upon the affinities of the forms in question.

DEAR DR. EASTMAN:

The following notes are at your disposal for any use you may care to make of them. I should now separate *Crenilabrus* C. & V. as a valid genus from *Symphodus* Raf. (=*Coricus* C. & V.), with which I united it in 1891. *Symphodus* (*scina*) has the general characters of *Crenilabrus*, the serrated preopercle and other features, but it has the snout strongly produced, giving a concave profile, a matter probably worthy of generic distinction. *Crenilabrus* like *Symphodus* has 13 to 15 dorsal spines, and 31 to 33 vertebræ. I do not see how *C. szajnochæ* can be properly placed in it, as these numbers are fairly constant within the same genus. *C. szajnochæ* should form the type of a new genus.

Pygæus appears to be a generalized type, with traits ancestral to the Chætodonts, the Acanthuridæ, and to *Siganus* (*Amphacanthus*). It has the long and strong dorsal spines and the numerous anal spines of *Siganus*, as well as the few soft rays, large vertebræ and the general form of the body. The teeth are apparently much as in *Siganus*, and not brush-like as in the Chætodontidæ. The Siganidæ are scaleless, but in *Pygæus* the scales are small and prickle-like as in the Acanthuridæ and Zanclidæ.

The ventral fins in *Pygæus* seem normal (I., 5), but in *Siganus* the inner ray is also a strong spine, the formula being I., 4, I. In most Chætodonts there are but three anal spines, and no more in any of the Acanthuridæ. *Megaprotodon*, a genus of Chætodonts, has, however, four anal spines, and its form suggests resemblance to *Pygæus*.

Taking the somewhat minute differentiation of families accepted amongst recent fishes, *Pygæus* may be made the type of a family Pygæidæ, allied to *Siganus* on the one hand, and to *Megaprotodon* and *Zanclus* on the other; and, perhaps, related to the common ancestor of all these. * * *

After Gill I use the name '*Teuthis* L.' for *Teuthis hepatus*, for which Linnæus devised the name. This is equivalent to '*Acanthurus*' of most authors. Forskål's original *Acanthurus* (=*Monoceros*, =*Naseus*) has two hooks on the tail instead of a sharp spine, the ventrals being I., 3, instead of I., 5. *Acanthurus gaudryi* will probably turn out a new genus near *Teuthis*, but not quite the same. In our day *Teuthis* has nine dorsal spines and a movable caudal spine. *A. gaudryi* is nearer the Pacific genus *Zebrasoma*, which has three to five dorsal spines and the soft rays high. * * *

DAVID S. JORDAN.

It should be noted that Agassiz suggested the propriety of dividing *Pygæus* into two groups, *P. bolcanus* being taken as type of the one, and *P. coleanus* of the other. President

* *Bull. Museum Comp. Zool.*, Vol. XLVI., No. 1, June, 1904.

Jordan's remarks apply to the species resembling *P. bolcanus*. C. R. EASTMAN.

HARVARD UNIVERSITY,
CAMBRIDGE, MASS.

THE ASCENT OF WATER.

TO THE EDITOR OF SCIENCE: The identity between leaves and roots of trees which is signalized by the criticism in your last issue probably signifies that they have the same sort of resemblance as the entrance and exit of a building. But the critic can not be entirely ignorant of the recent researches which establish their antithetical relation so far as the contention of my paper is concerned. Near the leaves the ducts have an extreme vacuum, so long as transpiration from the leaf-surface continues; this vacuum diminishes downwards towards the base of the stem, as in a suction pump; and the inward current of water at the base is still dependent (when root-pressure is inactive) on a difference between the atmospheric pressure and the tension within the ducts. The results and authorities are summarized in Pfeffer's 'Physiology,' also in E. B. Copeland's paper in *Botanical Gazette* (October 19, 1902), and in Livingston's valuable book on 'The Rôle of Diffusion.' Whilst using these results my paper added nothing to them. Its only aim was to remove a stumbling block which was caused by the tortious assumption that atmospheric pressure can not lift water more than 1033 centimeters high. As the mixture of air and water within the ducts appears to be in the condition of foam, such pressure probably suffices to elevate it to the top of the loftiest trees. This is the part that ought to be criticized.

I am much obliged to the editor of SCIENCE for permitting me to submit the facts to his great constituency. And now I wish to withdraw from the case, and to leave its further consideration to others. G. MACLOSKIE.

PRINCETON UNIVERSITY,
August 8, 1904.

ANALYSIS OF A COMPLEX MUSICAL TONE.

THE analysis of a musical tone by means of Helmholtz's resonators makes a good lecture experiment when so carried out as to be heard by a large audience. Whether this has been accomplished by others I do not know, but I have succeeded as follows: A telephone receiver is connected to alternating current lighting mains (frequency 133 cycles per second) through a resistance sufficient to reduce the current to about $\frac{1}{8}$ ampere. The telephone then emits a tone having a fundamental pitch of 266 vibrations per second, and of which the overtones are prominent.

An adjusted resonator held over the mouth of the telephone strengthens the overtone to which it is tuned so as to make the overtone easily audible throughout a large room.

I have had no difficulty in demonstrating eight successive overtones in this way.

W. S. FRANKLIN.

SPECIAL ARTICLES.

THE EFFECT OF RADIUM RAYS ON THE COLON BACILLUS, THE DIPHTHERIA BACILLUS AND YEAST.

THE discovery that rays emitted from salts of radium may be used therapeutically in the treatment of some diseases, has opened an interesting field for conjecture as to the manner in which these rays act, and naturally suggests experiments concerning their effect on bacteria in general, and especially on specific microorganisms.

A few investigators have already published results of such experiments. Pfeiffer and Friedberger,* for example, found that typhoid fever bacilli were destroyed by exposure to the action of radium rays for forty-eight hours at a distance of about 1 cm., but not at 5 cm. distance. They found further that the bacteria only were affected, and that the culture medium remained unchanged. Anthrax spores dried on silk threads were destroyed after exposure for three periods of twenty-four hours each, but not after two twenty-four-hour exposures. G. Bohn† has also reported that 'lower organisms' are quickly destroyed by the action of radium rays.

* Pfeiffer, R., and Friedberger, E., 'Ueber die bakterientötende Wirkung der Radium-Strahlen,' *Berl. klin. Wochenschrift*, 1903, No. 28.

† Bohn, G., 'A propos de l'action toxique de l'emanation du radium,' *Soc. Biol.*, 55, p. 1655.

On the other hand Van Beuren and Zinsser,* as a result of a small number of experiments, were unable to ascribe with certainty any bactericidal properties to radium, and explained the few cases in which harmful action seemed to have resulted as due to the experimental error of the methods employed.

At the suggestion, and through the kindness, of Dr. Francis H. Williams, of Boston, who has employed radium in practice with marked success, I was recently enabled to make, under favorable conditions, some experiments to determine the effect, if any, of a brief exposure to radium rays of two well known species of bacteria (the common intestinal bacillus and the bacillus of diphtheria), and one blastomycetous fungus (yeast).

The radium salt used in my experiment was the pure bromide having an estimated radioactivity of 1,500,000 units. This salt emits three distinct sets of rays, known respectively as the alpha, the beta and the gamma rays. Of these the alpha rays are lacking in power and are readily absorbed by most substances, as, for example, by a mica plate, or a sheet of paper, so that they are without special interest in this connection. The beta rays are absorbed by certain substances, aluminium, for example, but if not cut off by these may be active at short distances, perhaps within five centimeters. The gamma rays are active at greater distances, even up to several meters, and are not readily absorbed. The number of gamma rays to beta rays is about one to fifteen.

It is easy to observe the combined action of the beta and gamma rays by exposing a culture of micro-organisms at a short distance from the radium, and the effect of gamma rays alone can be determined by interposing an aluminium screen of about one eighth inch in thickness. In my experiments the radium was enclosed in a metallic capsule closed on the upper side with a thin mica plate, and the whole was then covered by stretching over it a thin coat of rubber. Neither beta nor gamma rays were thus intercepted.

* Van Beuren, F., and Zinsser, H., 'Some Experiments with Radium on Bacteria,' *American Medicine*, December, 1903.

The first series of experiments was made upon the intestinal bacillus (*B. coli*), this being taken as a typical nonspore-forming organism, comparatively sensitive to environmental conditions. Active bacteria from streak cultures twenty-four to forty-eight hours old were inoculated into freshly poured agar plates. In some cases the organisms were spread out in thin surface films forming spots perhaps 5 cm. in diameter, while in other cases intersecting lines were drawn upon the surface of the agar with an infected needle. The plate cultures thus prepared were then exposed to the action of radium rays for different length of time, and at various short distances.

The radium capsule was fixed, mica-side uppermost, on a sterilized plate-glass table, and a plate culture, the cover having been removed, was inverted above it, and so placed that the infected area was exactly over and near the mica window. Protection from dust was secured by covering with a sterilized glass bell-jar. After the exposure the cultures were removed, their covers replaced, and the bacteria incubated for twelve to twenty-four hours at 37°. Control plates were made in every case, and the two sets were carefully examined, the general and microscopical appearance of the cultures, and the culture characteristics being noted.

Organism.	Distance from Radium.	Time of Exposure.	Result.
B. coli	2 cm.	20 min.	Negative.
" "	1 "	20 "	"
" "	2 "	30 "	Growth not inhib.
" "	1 "	30 "	"
" "	1 "	40 "	"
" "	1 "	45 "	"
" "	1 "	50 "	"
" "	1 "	60 "	"
" "	1 "	75 "	"
" "	1 "	80 "	"

At the outset brief exposures were made at distances of one and two centimeters. These having failed to show that the radium had any inhibitory or deleterious effect, the time of exposure was gradually increased in later experiments and the distance restricted to one centimeter or slightly less. Careful scrutiny failed to show that the radium had any harmful

action upon the bacteria. Details are given in the following table.

The action of radium rays upon the diphtheria bacillus (*B. diphtheriæ*) was next studied, the methods employed being the same as with *B. coli*. This organism was selected (1) because it may be regarded as a typical pathogenic microbe; and (2) because it has been suggested that radium, on account of its germicidal action, may be conveniently applied in the treatment of diphtheria. In such treatment the radium is to be encased in special tubes (to be obtained from dealers in radium) and these tubes inserted in the throat, whereupon, it has been claimed, the organisms will be destroyed. It has even been hinted that radium may replace antitoxin in medical practice.

Two cultures of *B. diphtheriæ* were experimented upon—one a laboratory culture of several generations since isolation, the other a recently isolated, virulent culture. As with *B. coli* the length of the exposure to the action of radium varied considerably, and in all cases the results were negative, as will be seen from the table.

Organism.	Distance from Radium.	Time of Exposure.	Result.
B. diphtheriæ	2 cm.	20 min.	Neg. Growth not inhib.
" "	1 "	20 "	" " " "
" "	2 "	30 "	" " " "
" "	1 "	30 "	" " " "
" "	1 "	40 "	" " " "
" "	1 "	50 "	" " " "
" "	1 "	60 "	" " " "
" "	1 "	70 "	" " " "
" "	1 "	80 "	" " " "

No experimental evidence whatever was obtained which would indicate that any degree of success can be hoped for in treating diphtheria by destroying the specific micro-organisms by means of radium rays.

A few experiments were also made to determine the action of radium on fungi other than bacteria, and for this purpose domesticated yeast (*Saccharomyces cerevisiæ*) was employed as a type of the blastomycetes. The method differed from that used with *B. coli* and *B. diphtheriæ* only in the fact that a wort-gelatine medium replaced nutrient agar, and that the plates were incubated at 25° instead of at 37°. As in the experiments with bacteria, negative results only were obtained, the most careful scrutiny failing to reveal any destruction, or even any inhibition, of the life or growth of the micro-organisms.

Organism.	Distance from Radium.	Time of Exposure.	Result.
Sac. cerevisiæ	1 cm.	20 min.	Neg. Growth not inhib.
" "	1 "	30 "	" " " "
" "	1 "	40 "	" " " "
" "	1 "	60 "	" " " "
" "	1 "	80 "	" " " "

These experiments and the conclusions to be drawn from them may be summarized by the following statements.

1. Radium rays have no effect upon fresh cultures of *B. coli, B. diphtheriæ,* or *Saccharomyces cerevisiæ* at a distance of one centimeter when the time of exposure is less than ninety minutes.

2. Any advantages derived from the therapeutic use of radium must be explained in some other way than by the direct weakening or destruction of the micro-organisms of disease.

3. The use of radium tubes in the treatment of diphtheria can not be recommended or regarded as a substitute for antitoxin.

In conclusion, I desire to express my obligation to Dr. F. H. Williams for the opportunity to carry on these experiments, and for many helpful suggestions.

S. C. Prescott.

The Biological Laboratories,
Mass. Inst. Technology,
July 30, 1904.

A WHEAT-RYE HYBRID.

To the Editor of Science: A few preliminary notes as to distribution of parental characters observed in the above type of hybrid grown by the writer during the present season may be interesting. The cross was obtained in May, 1903, by using a Russian variety of rye as the pollen- and Jones' Winter Fife as the seed-parent. No reciprocal crosses were attempted. Several seeds resulted, of which a few showed apparent xenia, the blue-gray color of the rye seed-coat being very evident

in the hybrid seed in some cases. Grown through the past winter and spring, and coming into maturity during July, it became apparent as the heads came out, that but one of the supposed hybrid plants was to exhibit rye characters in its gross morphology. This one, however, is most interesting. The general type of the head is that of the rye throughout, long, narrow and nodding. The spikelets have the elongate narrow form of rye spikelets, but lack the awns on the flowering glumes, which are, moreover, markedly pubescent like those of the wheat parent. The empty glumes are of the *Triticum* rather than the *Secale* type. In form of outline the anthers differ altogether from those of either parent. The leaves of the hybrid were free from the rust that affected the wheat parent. Four heads were produced by the hybrid plant, all of which were alike in type. Variance among the different heads borne on the same plant has been observed by the writer in the case of wheat variety-hybrids. But in this instance no such phenomenon was evident. Any observer would have recognized at a casual glance the extraordinary rye form in the entire group of hybrid heads. Material killed in Flemming's solution of the sporophyte vegetative structures and of stages in the development of the spores in the hybrid and of both of its parents, will be studied later, with respect to cytological details. It should be stated that attempts at crossing the rye again on the hybrid failed, and that none of the hybrid flowers became self-fertilized with one exception. The result, however, is a seed badly shriveled in the region of the embryo, and which does not promise germination.

H. F. ROBERTS.

KANSAS EXPERIMENT STATION,
MANHATTAN, KANSAS,
July 29, 1904.

NOTES ON INORGANIC CHEMISTRY.

THE MELTING POINT OF GOLD.

No little work has been done in recent years on the determination of the melting point of pure gold, as owing to the ease with which gold can be obtained in a very pure condition, this affords a valuable constant for high temperature work. In the latest experiments, which have been carried out by Jacquerod and Perrot and described in the *Comptes Rendus,* advantage has been taken of the fused quartz nitrogen thermometer, as owing to the small coefficient of silica, the correction for the expansion of the bulb is very small. The gold was heated in a special type of electrical resistance furnace, in which the temperature could be very accurately controlled, and the comparison with the thermometer was direct. The fusing point was found to be 1067.2° C. which is slightly higher than the 1061° determined by Callendar, Heycock and Neville, but lower than some other recent determinations.

FUSED SOAPSTONE FIBERS.

THE use of fused quartz was first brought to notice by Professor Boys, who found that quartz could be drawn into exceedingly fine fibers, which especially on account of their small elastic fatigue were superior to all other fibers for suspensions. From this beginning, by the labors of Professor Shenstone and others, the possibility of using fused quartz on a much larger scale has been realized, and now all the commoner forms of laboratory utensils can be made of this material. The chief advantages are the great resistance of quartz to most reagents, and its small coefficient of expansion. In a recent number of the *Physical Review,* Mr. K. E. Guthe shows that fused soapstone can be used to some extent like fused quartz. When heated in the gas-oxygen flame, it melts readily to a clear glass and can be drawn out into very fine fibers which have all the advantages of quartz fibers, and it is possible that other industrial uses may be found for it.

EXPLOSIONS FROM FERROSILICON.

LAST January two mysterious explosions took place at Liverpool in drums containing ferrosilicon. The cause of these explosions has been investigated by A. Dupré and M. B. Lloyd, and a paper dealing with the subject was read by them at the meeting of the Iron and Steel Institute. They consider that the probable cause of the explosions was the presence in the drums of water, which by its action upon the ferrosilicon occasioned the gen-

eration of silicon hydrids. These with the air in the drums formed an explosive mixture, which could be readily ignited by the friction between the lumps of ferrosilicon, or possibly by the presence of a phosphin which was spontaneously inflammable. Although these particular explosions were not very serious, the authors feel that attention should be called to the possibility of accidents of this kind in storing and shipping ferrosilicon, and make the suggestion that care should be taken that it always be kept dry and in a place where it will be well ventilated, thereby insuring against the possible accumulation of inflammable gases.

BESSEMER VS. OPEN-HEARTH.

At the same meeting Mr. F. J. R. Carulla made an appeal for the preservation of the Bessemer steel-industry. He described the manufacture of Bessemer rails in 1874 and held that the uniformity of the product then obtained left nothing to be desired. These requirements could and should be equally well fulfilled at the present day, and improvements should be made in the modern Bessemer process to enable this. This process ought not to be completely relegated to the rear by the development of the open-hearth furnace.

ROYAL SOCIETY CONVERSAZIONES.

The two conversaziones of the Royal Society held this year in May and June contained, from the descriptions in *Nature*, less than usual of interest to chemists. Naturally there were several exhibits in connection with radioactivity, the most interesting being an apparatus showing the spontaneous electrification of radium by Hon. R. J. Strutt. The radium salt in a glass tube is hung by an insulating support in an exhausted vessel. An electroscope is attached to the radium tube. Negatively electrified particles from the radium penetrate the glass tube which is covered with a conducting coating of phosphoric acid, so as to act as an inductor. Thus a positive charge is left and causes divergence. When the electroscope leaf touches the outer vessel, which is grounded, it collapses, and then begins to charge up again. This action goes on as long as the radium lasts.

Dr. Alan B. Green exhibited photographs illustrative of induced radioactivity of bacteria. Small masses of bacterial growth were exposed to the β and γ rays of radium bromid. Many of these masses when removed from the influence of the radium and placed between two thin plates of glass, were capable of affecting the photographic plate, even through a double layer of lead foil.

Mr. William Burton and Mr. Joseph Burton exhibited specimens of newly discovered crystalline glazes developed on English earthen and stoneware. These are artificial crystalline silicates, formed during the firing and cooling of the wares. In the 'sunstone' and 'fiery' glazes, the crystals show the optical properties of micas, in the starry and opalescent glazes the radiating needles are akin to the mineral willemite, as is shown both by their optical properties and chemical composition. The writer recalls that a year ago an American potter showed him a number of tiles with glazes similar to these last, with which he was then experimenting, hoping to produce them upon wares. They were remarkably beautiful, but it is not known whether they have yet been produced commercially, either in this country or in England.

NATURE OF SOLUTIONS.

Two important papers on solutions have recently appeared from Lobry de Bruyn in the *Recueil des Travaux Chimiques des Pays-Bas*. The first, in collaboration with L. K. Wolff, is on the possibility of detecting the presence of molecules in solutions by Tyndall's optical method. Spring has devised the method of rendering liquids optically clear, that is, showing no trace of a strong ray of light directed through them, by producing in them a precipitate of a colloidal hydroxid. This precipitate on settling carries down with it every solid particle which may have been suspended in the liquid. It was noted, however, by Spring that solutions of certain salts like alum and ferric chlorid could not be made optically clear and this was attributed to the formation of basic salts by hydrolytic dissociation. These basic salts form solid particles of ultra-microscopic size, which never-

theless are large enough to reflect and also to polarize light. These luminescent solutions are called pseudo-solutions. In true colloidal solutions the maximum diameter of the particles was found to be 5 $\mu\mu$, that is about ten times as large as the mean diameter of molecules. This raises the question as to whether there is any real boundary between true solutions and colloidal solutions. If not, substances with very large molecular weight ought to give evidence when in solution of interruption of a ray of light similar to that of colloidal solutions. It was found that water rendered optically clear was not affected by the addition of urea, acetamid, methyl or ethyl alcohol, but light reflected vertically from a solution of saccharose (mol. wt. 342) and raffinose (mol. wt. 504) was polarized. Strong luminescence was given by a solution of phosphomolybdic acid. The authors consider it probable that with sufficiently strong source of light even substances of lower molecular weight would show reflection from the dissolved molecules.

The second paper, whose co-author is R. P. Van Calcar, is on the effect of centrifugal force on dissolved substances. The solutions were submitted to a centrifugal force 400 times that of gravity. Under these conditions a one fifth normal solution of potassium iodid showed after three hours pure water in the upper portion, a concentration of 0.1 normal immediately below, 0.32 normal at the top of the lower half and one fourth normal at the bottom. In a number of other cases solutions became manifestly more concentrated at the periphery. In a solution containing 8.78 per cent. of sodium sulfate after five hours rotation a considerable amount of Glauber's salts, Na_2SO_4, $10H_2O$, had crystallized out and the remaining solution contained only 5.54 per cent. of sodium sulfate. These results are the more important, as it has generally been accepted since the negative experiments of Gay-Lussac, that the molecules in a true solution were unaffected by gravity, and hence were in a different state from those in colloidal or pseudo solutions, and it also confirms from a different point of view the results of Lobry de Bruyn and Wolff described above.

J. L. H.

SOCIAL AND ECONOMIC SCIENCE.

UNIVERSITY COMPETITION FOR GRADUATE STUDENTS.

IN his latest annual report President Hadley, of Yale, calls attention to this phase of university effort in the following statement: "For some time past many of the universities of the country have been engaged in a rather unfortunate competition for graduate students. There was in certain quarters a tendency to measure the success and usefulness of an institution by the numbers enrolled for graduate study. Under the influence of these ideas there has been a strong tendency to treat graduate students in the present generation as divinity students were treated a generation ago—giving them not only free tuition, but a great many other pecuniary inducements to pursue special studies for the degree of doctor of philosophy.

"This course of action involves an inversion of the true order of things. If you have real interest in science and literature you will probably have a number of men pursuing courses for the degree of doctor of philosophy; but it by no means follows that if you have a number of men pursuing courses for the doctorate of philosophy you will have a corresponding amount of interest in science and literature. On the contrary, this attempt to subsidize graduate students too often increases numbers at the expense of quality; and so far as it does this is bad. A good graduate student is about the best man that we have in the university; a poor graduate student is about the worst man. The same conditions which allow a man to rise above the average of his fellows if he has the ability and stimulus in himself allow him to fall below his fellows if he has not that ability and stimulus. * * * If the numbers of the graduate students increase instead of diminish it will be a source of congratulation; but it will be far better to submit to some loss of numbers than to continue a form of competition which is prejudicial to the quality of the students, wasteful of the resources of the university, and based upon an imperfect appreciation of the purposes and scope of university work. A uni-

versity exists for creating and maintaining standards, intellectual and moral. In order to have the highest intellectual standards, it must be a place where progressive thought is pursued and cultivated. But the number of men who claim to be occupied with the pursuit of progressive thought is no sure criterion of the degree to which the university is upholding such standards."

SERVICE OF SCIENCE IN SOCIAL WORK.

THE application of the laboratory method of training to the study of social subjects of vital importance to the community, especially to municipal communities, is well exemplified by the School of Philanthropy, conducted by the Charity Organization Society of New York City.

The Committee on Philanthropic Education, under whose auspices the summer school has been held in New York City for six weeks of each summer for the past six years, established last year a winter course, primarily intended for those who are engaged in practical social work, and who could give only a limited amount of time to lectures, class exercises and study. For this purpose the course was entirely successful, 159 students being registered, 121 eligible for, and 50 receiving, certificates.

It was later decided greatly to extend the scope of this course, and to offer a sufficient amount of instruction to justify those who enroll in it in devoting their entire time to it during the academic year.

Arrangements were made for extended courses of lectures on each of the more important branches of social work, such as: The care of families in their homes; the care of dependent children, both in institutions and by placing-out agencies; the care of the sick in hospitals, by dispensaries, by district nurses, etc.; state and municipal charities; reformatories, prisons and asylums; official inspection, sanitary and industrial; neighborhood work, civic improvement and educational advance.

The courses for the coming winter consist of from four to twelve lectures each, and include discussions by students, and opportunities for personal consultation with instructors. There will be, in addition, single lectures by eminent persons, dealing with particular institutions or problems upon which they are especially qualified to speak.

The enrollment will be limited to the following classes:

1. Men and women who have been engaged for one year or more in some form of philanthropic activity, as a profession, and who desire to improve their knowledge of the methods of social service.

2. College graduates who have taken at least one year's work in social economics or some kindred subject.

3. Senior students in theological seminaries or medical colleges who may wish, by special arrangement, to take one or more courses of lectures.

4. Others who satisfy the director by some indication of fitness, that they are likely to profit by the opportunities of the school.

One of the best services such enterprises render to society is the diffusion of the discoveries, often of a preventive character of course, of the various branches of natural science among the very people who are in most need of them. The distance between the scientific laboratory and the 'submerged tenth' is very great indeed; but the well-trained social worker does a very large share in bridging that distance and, therefore, in proving the value of science to the general welfare. The whole propaganda of sanitation depends on this process of enlightening popular sentiment to its own advantage, and thus increasing the economic efficiency of the less capable portion of the population.

VIRGINIA'S PROGRAM OF EDUCATIONAL PURPOSES.

THE Cooperative Education Commission of Virginia, which was organized last March, has formulated a policy under the title of a 'program of purposes' which have recently been made public. These purposes constitute a comprehensive scheme of objects in which it is desired that all the varied educational interests of the state should unite. They are as follows:

1. A nine months' school for every child.

2. A high school within reasonable distance of every child.

3. Well-trained teachers for all public schools.

4. Efficient supervision of schools.

5. The introduction of agricultural and industrial training into the schools.

6. The promotion of libraries and correlation of public libraries and public schools.

7. Schools for the defective and dependent classes.

8. The organization of a citizens' education association in every county and city.

9. Local taxation.

The commission as formed is said to be a thoroughly representative one. As may be inferred from the foregoing nine objects, it has for its purpose the unification of educational forces, with a view of utilizing their combined wisdom and strength in reenforcing the efforts of the state and local authorities in the matter of perfecting the public school system of Virginia. Such a movement as this is particularly promising on account of the hitherto independent development of educational institutions without that degree of correlation which would be advantageous to all.

A FUND of $30,000 has been secured through the efforts of Professor Richard T. Ely, of Wisconsin University, for the purpose of making an extended inquiry into the industrial history of the United States in its bearings upon the labor problems. The length of time to be occupied will probably extend to five years. Professor John R. Commons will be associated with Professor Ely, together with a corps of assistants.

THE national budget of France for the year 1904 carries an expenditure of $45,914,700 for public instruction and the fine arts, compared with $38,600,000 in 1894, or an increase of 19 per cent. in ten years.

JOHN FRANKLIN CROWELL,
Secretary, Section I, A. A. A. S.
WASHINGTON, D. C.

OPPORTUNITIES IN ANTHROPOLOGY AT THE WORLD'S FAIR.

Now that the Department of Anthropology and cognate branches of the Exposition are well under way, it has become clear that the Louisiana Purchase Exposition affords unequalled opportunities for ethnologic study. The original plans for the department are so far fulfilled (largely by the great Philippine Exhibit, the Department of Physical Culture, etc.) as to bring to the exposition the largest assemblage of the world's peoples in the world's history. Some of the alien groups have been selected especially to represent distinct ethnic types; and nearly all the groups have been selected with special reference to culture-grade, so that every known stage of industrial and social development is typified among the peoples on the exposition grounds. Accordingly, students and teachers of anthropology in all its branches may have in St. Louis during the present summer opportunities for original and instructional work such as could not be enjoyed otherwise except at the cost in time and money of extensive journeys with attendant hardships. The exposition authorities appreciate the opportunity and undertake to afford students and teachers every facility consistent with the primary purposes of the exposition.

The department comprises sections of ethnology, illustrated chiefly by living groups, partly by collections of artifacts; Indian school work, illustrated by a model school in actual operation; archeology, illustrated by typical collections and series of aboriginal artifacts; history, illustrated especially by relics and records of the transition of the territory from the aboriginal condition to that of advanced enlightenment; anthropometry, which is devoted to apparatus and laboratory work in which the assembled physical types are measured and recorded; and psychometry, likewise devoted to apparatus and laboratory tests of sense reactions and other psychic characters of the types of mankind. The four sections last named are accommodated in the Anthropology Building in the western portion of the grounds; the Indian school is housed in a special building near by; and the alien groups of the department occupy native habitations about this building and intermediate between the extensive Philippine exhibits on the south and the Physical Culture Department on the

northwest. Thus the sections of special interest to students and teachers of anthropology are fairly segregated though within easy reach of the impressive display of the achievements of modern man in the large exhibit palaces.

Among the special lines of opportunity for original and instructional work the following may be noted:

1. Somatology; the comparative study of physical types representing many distinct peoples.

2. Psychology; the study of psychic characteristics, both experimentally and through habitual conduct and expression.

3. Arts and industries; the comparative study and record of manual operations and their products among typical peoples.

4. Languages; the record and comparison of scores of distinct tongues, covering the entire range from the most primitive known to the most highly advanced.

5. Law and socialry; the comparative study of all known culture-grades as defined in terms of social organization.

6. Faiths and philosophies; the study and comparison of many widely different systems of thought, ranging from the simplest upward.

7. General ethnology; the comparative study of over a hundred distinct tribes and peoples (those brought in by the department including the Ainu, Patagonians, Pygmies, 'Red Africans,' Cocopa Indians from Baja California, Klaokwaht Indians from Vancouver Island, and over a dozen tribes of United States Indians, and the Philippine exhibit including all the leading tribes of the Archipelago).

8. General anthropology; the comparative study of primitive and advanced peoples in an unexampled assemblage of race-types and culture-grades.

9. Record work; the making and preservation of records including lists and tables of measurements, sketches and diagrams, photographs, life casts, life models, paintings, sculptures, etc.

The attention of educational institutions is especially invited to the opportunity for establishing and maintaining field schools in connection with the exposition. Every possible facility will be afforded not only by the chief of the department but by the director of exhibits and the exposition authorities generally for the satisfactory conduct of such schools.

The attention of museum officers is especially invited to the opportunities for obtaining direct representations of ethnic and other types of mankind at but a fraction of the cost ordinarily involved.

Should university, college and museum authorities signify a desire to utilize the opportunities afforded by the department, plans will be framed with the view of coordinating the requirements of all and affording each the largest facilities consistent with the demands of others; the sole purpose of the department being to place the anthropological collections of the exposition within reach of the largest possible number of workers and teachers.

Copies of this letter have been sent direct to a number of educational institutions and museums.

W J McGee.

SCIENTIFIC NOTES AND NEWS.

William Barton Rogers, the eminent geologist, was born on December 7, 1804, and the October number of the *Review* of the Massachusetts Institute of Technology will be largely given to a life of Rogers, dealing especially with his work in planning and founding the institute.

The Franklin Institute, Philadelphia, has awarded an Elliott Cresson Medal to James M. Dodge, of Philadelphia, for his cold storage system and to Dr. Hans Goldschmidt for his inventions in aluminothermics.

Senhor Augusto Ribeiro, head of the political department, Portuguese Colonial Office, and Dr. Don Eulogio Delgado, president of the Lima Geographical Society, have been elected honorary corresponding members of the Royal Geographical Society.

Dr. Willis R. Whitney, professor of theoretical chemistry at the Massachusetts Institute of Technology, has resigned to take charge of the research laboratories of the General Electrical Company's works at Schenectady.

Durham University has conferred the degree of D.Sc. on Mr. R. A. Sampson, F.R.S.,

professor of mathematics in the Durham College of Science.

THE daily papers state that Professor Frederick Starr, professor of anthropology at the University of Chicago, will resign and will make an extended expedition to Japan and China.

THE N. Y. *Evening Post* states that Professor E. W. Woodworth, of the department of entomology at the University of California, has for some time been studying silkworm culture on the Pacific Coast. He is trying to determine whether silkworms may be raised in California on a scale that would make their propagation a commercial success.

JAMES H. MONTGOMERY, Ph.D., vice-president of Allegheny College, Meadsville, Pa., member of the American Association, died on August 11, at the age of fifty years.

DR. JOSEPH WIENER, who came from Bohemia to New York in 1849 and was at one time professor of pathology in the College of Physicians and Surgeons, died on August 11, at the age of seventy-six years.

DR. FRIEDRICH RATZEL, professor of geography at Leipzig, well-known in this country for his important work on the geography of North America, died on August 9.

THE deaths are announced of Sir William Banks, a well-known British surgeon who took a prominent part in the work of the medical school of the University of Liverpool, where he was emeritus professor of anatomy, and of Sir Frederic Bateman, a prominent physician of Norwich, the author of works on aphasia and other subjects.

THERE will be a civil service examination on September 14 and 15 to fill a vacancy in the position of anatomist (male), at $1,600 per annum, in the Army Medical Museum, office of the surgeon-general, and other similar vacancies as they may occur.

THE committee appointed by the Texas legislature to investigate methods for the extermination of the boll weevil and pay a reward of $50,000 to the discoverer of any such method has decided that no one has earned this reward.

THE American Microscopical Society will meet at Buffalo, New York, on August 23, 24 and 25, under the presidency of Professor T. J. Burrill, of the University of Illinois. The meetings will be held in the lecture room of the Buffalo Society of Natural History, Hotel Lafayette being the headquarters. The subject of the president's address, which will be given on the evening of August 24, will be 'Microorganisms of the soil and human welfare.' Attention may be called to the fact that this meeting is the consummation of 25 years of existence and is therefore of special interest. A National Microscopical Congress, held at Indianapolis, Ind., in 1878, appointed a committee on organization, and at Buffalo, N. Y., in 1879, was founded the American Society of Microscopists, which, in 1892, became the American Microscopical Society; thus the twenty-fifth year of the society's existence ends with this meeting, the twenty-seventh if we count the meeting in Indianapolis, the twenty-sixth if we begin with the Buffalo meeting.

THE St. Marylebone Natural Science Society, London, which has been in existence for the past six years, has celebrated the opening of a new museum and lecture hall, 444 Edgware Road. The work of the society is carried out entirely by working people and is self-supporting.

A LONG vacation course which lasted till August 16, was arranged by the Oxford School of Geography, and was opened with an introductory address by Mr. H. J. Mackinder, student of Christ Church and reader in geography. According to a report in the London *Times* he said they were met together as a body of secondary and university teachers for the purpose of what he might describe as mental refreshment. It was their intention to spend the greater part of the next three weeks in the study of geography. Summer schools, of course, had their limitations, but none were more defensible than those intended for teachers. If secondary teaching was to retain its vitality, it was essential that, in the narrower subjects at any rate, there should be periodical contact between those whose daily duty it was to teach in school and those who were fortu-

nate enough to be mainly occupied in the advancement of their subject. No reading, however assiduous, could possibly replace the influence of personal intercourse. As regarded geography and education, he was delighted to tell them that real progress was being made. The lead originally given by the University of Oxford, acting in conjunction with the Royal Geographical Society, was being followed in other universities. The University of Cambridge was at this moment taking very active steps, which he trusted would meet with great success. The Universities of Liverpool and Manchester were placing economic geography under specialist teachers, in a favored position in the *curricula* of their new commercial degrees, and the University of Birmingham was following the lead of the University of London and of the London School of Economics. One thing, however, he regretted, that in the *curriculum* recently adopted by the British universities for the preparation of army candidates military topography, in the narrower sense, but not geography in the larger, had found a place. In this respect they were behind continental education. Surely, after the lessons in the Boer war, it was obvious that officers should above all things learn to think in terms of space, and in his experience this power came by the light of nature only to a very small percentage even of educated men. The whole basis of geography—and it was a thing which at this moment required saying in the light of certain tendencies in their universities—the whole basis of geography was physical. Historical and economic geography were merely empirical and unworthy of university study unless they regarded them as applications of physical geography. In fact, he claimed it as perhaps the happiest function of the subject that it should act as a link between the faculties of arts and natural science, which, owing to vested interests, were too much separated. A hybrid degree in arts and science mixed would in this twentieth century be one of the finest preparations for practical life in the world. It was grotesque that men should be regarded as educated who did not know even the modes of scientific thought. It was equally absurd that scientific students should be regarded as educated if they had not availed themselves of the teaching of the humanities, which was a legacy of the past.

UNIVERSITY AND EDUCATIONAL NEWS.

Soon after the opening of the fall term the corner stone of the new library at Stanford University will be laid. It will cost $750,000, and have a capacity of 1,000,000 books.

It is reported that Mr. Henry Phipps has given $20,000 to the Johns Hopkins University for the study of tuberculosis.

The Drapers Company of London will give £30,000 toward paying the debt on the land and buildings of University College, London, to enable the College to be incorporated in the University of London.

The St. Andrews diploma of L.L.A.—which means 'lady literate in arts'!—has been given this year on examination to 101 candidates. It appears that 1,400 papers were written and passes were obtained in 766 instances. The distribution of subjects is rather curious. Nine passed in Latin, two in Greek, two in zoology, two in natural philosophy, seventy in geography, twenty-eight in botany, seventy in physiology, etc.

Dr. W. H. Newbold, professor of philosophy in the University of Pennsylvania, has resigned the deanship of the graduate school.

Dr. Frank Allen, senior instructor in physics in Cornell University, has been appointed to a lately established professorship in physics in the University of Manitoba, Winnipeg, Canada.

In the University of London, Dr. Edward Westermarck, formerly lecturer on sociology in the University of Finland, has been appointed lecturer in sociology (in connection with the Martin White benefaction); Mr. W. Legge Symes, M.R.C.S., university demonstrator in physiology; and Miss Beatrice Edgell, M.A., Ph.D., demonstrator in experimental psychology.